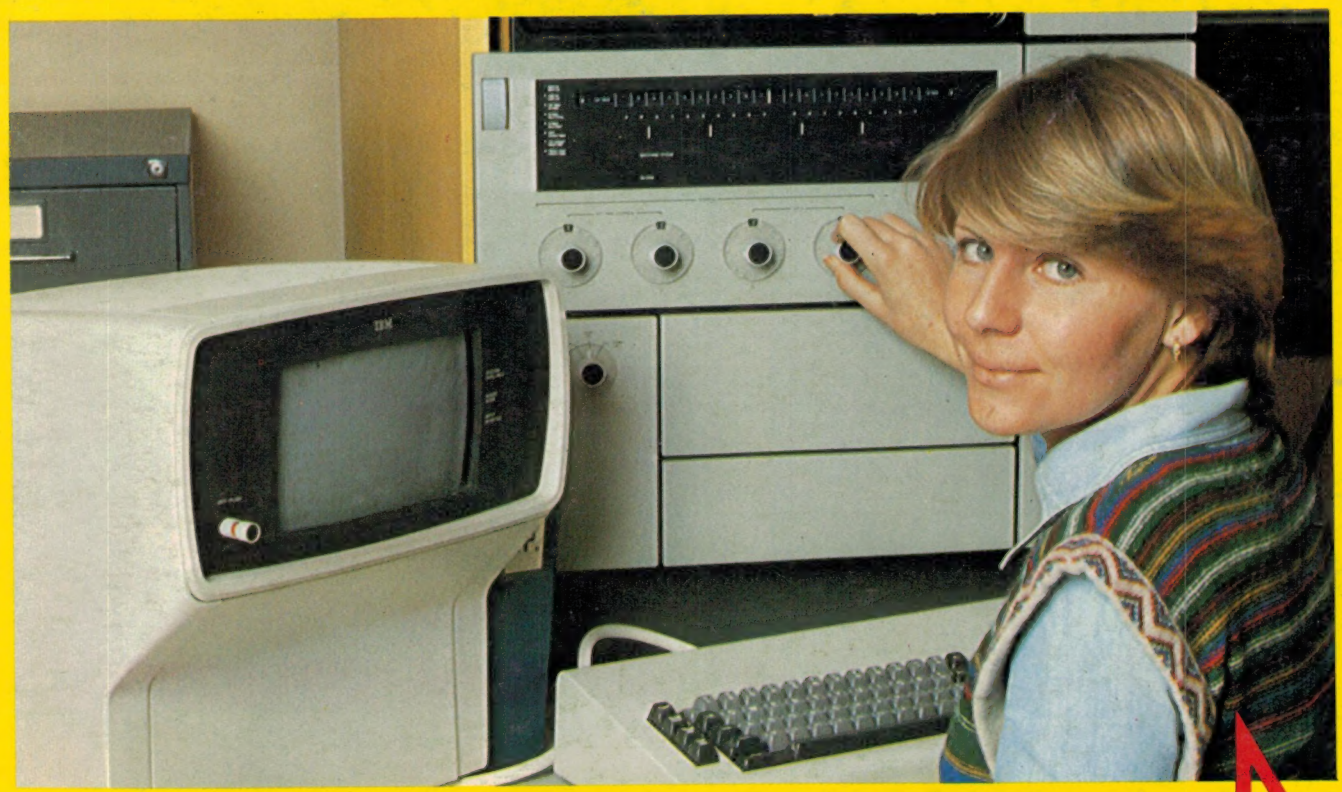
ELECTRONICS Australia

with CB and HIFI NEWS

NOVEMBER, 1977 AUST $1.25* NZ $1.25

SPECIAL OFFER ON 18-CHANNEL SSB CB RIG!

TV LISTENING AID * 5V/10A POWER SUPPLY



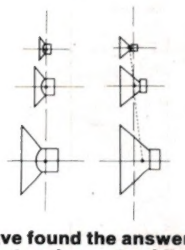
INVENTORY CONTROL & QUALITY TESTS AT TANDY

BONUS INSIDE: TANDY'S 132 PAGE '78 CATALOG

MORE THAN A CHAIN OF STORES: STORY INSIDE

WAY OUT FRONT
BECAUSE THEY'RE WAY OUT FRONT

SONY'S NEW G SERIES SPEAKERS.
WE LINED UP THE SOUND SOURCES—NOT THE SPEAKER EDGES—TO GET THE EDGE ON THE FRONT-NAME SPEAKERS.



We admit it, for years our front name reputation in audio and video hasn't quite been matched by our speakers.
So in 1972 we began a total new research programme specifically designed to put our speakers where all of our other stereo components have long been – out front.
After years of research and development our engineers have found the answers:
First spring water. Like good whisky, good cone papers depend on the purity of the water used in making them. So we built an entirely new factory at Kofu at the base of Mt. Fuji where we can get all the spring water we need.
Next there was the use of carbon fibre in our speaker cone paper. It's very strong and light. So our speakers are more efficient. And the carbon fibre prevents the cone from bending out of shape in the high frequency range. Moreover it doesn't resonate much. Which cuts out unwanted vibration.

Then so does our use of a cast basket rather than a cheap stamped one. Finally our big breakthrough came by breaking through the standard idea of simply attaching the front of each speaker to the baffle board.
By moving our woofer and mid-range forward to a position where the sound waves originate in the same line, we aligned them acoustically. The result is transparently smooth and deep sound over the entire audio frequency range.
It's a sound that specifications alone cannot describe.
But some of the toughest critics in the whole audio world can. They heard our new G Series speakers first at the last Japan Stereo Components Contest. Result? They awarded Sony the "Grand Prix".
Now hear this: The new Sony G Series speakers have arrived at your dealers. Listen to them and you'll hear just how beautiful five years' research can sound.

SONY.

Research makes the difference.

GAC-S-9777

ELECTRONICS Australia

Australia's largest selling electronics & hi-fi magazine
On sale the first Monday of each month

VOL. 39 No. 8 NOVEMBER, 1977

This month's issue carries a bonus 132-page Tandy Electronics catalog. You'll find it following p48.

This attractive 18-channel AM/SSB CB rig is currently on special offer to EA readers. You can find out how it performs on p58, and how to buy it on p54.

On the cover

Our cover pictures this month illustrate two of the behind-the-scenes activities of chain store electronics retailing: stock inventory and products acceptance testing. (Pictures courtesy Tandy International Electronics).

FEATURES

HIFI NEWS & REVIEWS

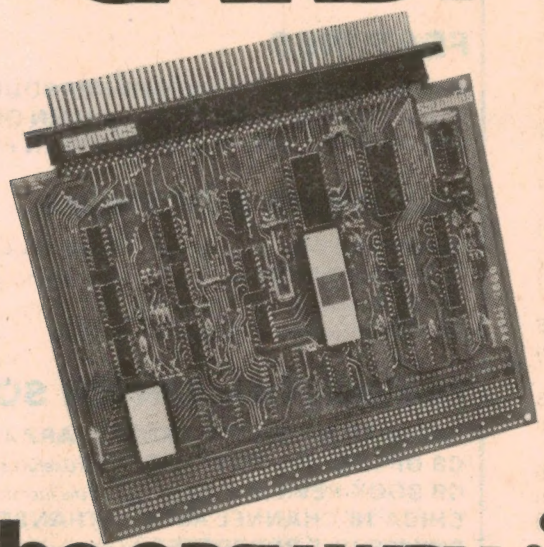
THE AUSTRALIAN CB SCENE

PROJECTS & CIRCUITS

COLUMNS

DEPARTMENTS

ADAPTABLE BOARD COMPUTER PROTOTYPING CARD.



The easy way to start in Microprocessors

Two easy steps:
Plug in, Hook up
+ 5 volts, ground, and a teletype,...and you're in business!
Here is a short list of features.

- 1 K BYTES ROM (PIPBUG EDITOR AND LOADER) BOARD EXPANDABLE TO 2 K BYTES ROM/PROM
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Editorial Viewpoint

Is Herman Huyer merely sounding off?

A recent issue of "Australian Financial Review" highlighted a speech by Mr H. D. Huyer, chairman and managing director of Philips Industries Holdings Ltd. In it, he drew attention to the erosion of the local electronics industry and called for a positive statement of Government policy on which the industry could decide to reinvest or phase itself out.

He has said as much before and there may be a tendency for some to dismiss it on the basis that Huyer is "sounding off" again; or crying wolf; or merely lamenting the changing fortunes of electronics manufacturers in general, and of Philips in particular.

Frankly, we don't go along with any such light dismissal of what was said. If Mr Huyer appears to be "sounding off" the explanation is not that he has said it too often, but that he tends to be a rather lone voice crying in the electronic wilderness. Where are all the others?

Unfortunately, many of those whose voices should be heard are no longer in the industry — having been the victims of the very erosion to which Mr Huyer refers. And it is rather whimsical that the forum for the remark should have been provided by the Institution of Radio and Electronics Engineers, a group which all too eloquently reflects the change. By and large, the once strong array of commercial engineers has gone, and the Institution's meetings and committees are dominated by academics and public servants. If they lament the "good old days" at all, they do so from the security of their own Government-funded ivory towers!

Perhaps the industry was over-protected, complacent and due for a shake-up; perhaps there were good reasons to encourage the influx of manufactured goods from Asia, to bring down prices and to encourage two-way trading. But the resulting policies, which have been pursued by both the major parties, have cut employment in the industry by half and, more than that, caused a massive switch in skills from making to selling.

It is true that there is some compensating activity in areas of high technology but we have become progressively more dependent on Asian suppliers for everyday bits and pieces, and for everyday items of manufactured goods. Is the Government going to reverse the trend, arrest it at some point, or merely allow it to run its course, to the extinction of all local grass-roots knowhow?

As Mr Huyer pointed out: technology is not something a nation can suddenly decide to recover. It is a reservoir of knowhow constantly being built up in a body of people trained in a particular profession, assimilating techniques as they become available and passing from generation to generation.

W. N. Williams

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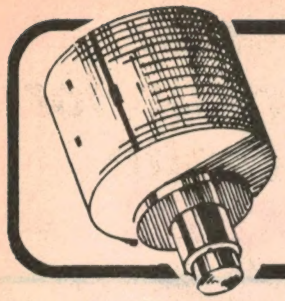

News Highlights

Computerland stores opening in Sydney, Melbourne

Little more than a year ago, a new type of retail store appeared in the USA: the computer store, specialising in hobby computers and small business systems. Since then, the stores have multiplied in a most dramatic way, with some 300 in operation throughout the USA by May this year.

One of the fastest-growing groups of stores is the Computerland chain, which is due to have around 60 stores operating by the end of this year. Operated on a franchise basis, they were started in September last year by Edward E. Faber, under the "Computer Shack" banner.

Now president of the renamed Computerland Corporation, Edward Faber has had more than 20 years' experience in the computer business. Just before launching his chain of stores, he was sales manager of Imsai, one of the pioneers in hobby computer manufacturing.

The big advantage of franchise chains like Computerland is that as a group they can buy from the manufacturers in bulk. This allows the stores to sell the products at a price significantly lower than if they were buying individually, while still being able to provide the degree of back-up service required in selling this type of product.

Starting this month, these advantages will be available to computer hobbyists and small users in Australia. The first Computerland store is opening in Sydney, right in the heart of the central business district. The location is the ground floor of a brand new building at 55 Clarence Street, and the store will have a layout and product inventory almost identical with the US stores.

A second store is due to be operating in Melbourne by Christmas, and if all goes well, there will be Computerland stores in all capital cities by the end of next year. In effect, the Computerland chain is being extended to cover Australia.

The stores will be carrying just about all of the major brand names: Apple Computer, Cromemco, DEC, Diablo, Hazeltine, Icom, Imsai, Lear Siegler, National Semiconductor, North Star, Texas Instruments, Vector Graphics and many more; also an array of tools, books and other items. And they'll be offering systems planning advice, software help and service back-up.

A Computerland staff member helping customers plan their system. Pictured at right is Mr Rudi Hoess, the man behind Computerland in Australia.

The man behind Computerland in Australia is managing director Rudi Hoess, who with his wife also runs Electronic Concepts Pty Ltd. Like Edward Faber in the USA, Rudi Hoess has considerable experience in the computer industry. He is also very experienced in marketing high-technology consumer goods, like calculators, digital watches and security alarms.

Based on his knowledge of the Australian market, and on insights gained from many trips to the USA, Rudi Hoess is confident that the Computerland concept will be just as successful here. If he's right, the future looks bright not just for Computerland, but for Australian computer hobbyists and small businesses as well. (J.R.)

. . . and we get our own Silicon Valley(s), too

Just as this issue went to press, it was announced that Cema Electronics has opened two new computer stores under the name "Silicon Valley". One of the new Silicon Valley stores is in the Sydney suburb of St Leonards, and the other in the Melbourne suburb of Richmond.

The stores are described as "professional computer stores", and are carrying a wide of microprocessor kits and associated products from manufacturers such as Motorola, Texas Instruments, AMI, Intel, National Semiconductor, Fairchild, Synertek, Burroughs and Philips. They will also be carrying a range of computer hobby magazines, such as Byte, Interface, and Kilobaud, and a broad selection of electronics components for the hobbyist and engineer — components like RAMs, ROMs and PROMs, UARTs, multiplexers and CMOS and TTL ICs.

The stores will also be providing supporting software and in-store programming services, provided by a team of experts with a broad background in microprocessor applications. And while the stores are designed to appeal particularly to the professional and advanced hobbyist, beginners will also be made welcome.

The motto used in the stores' opening advertising neatly plays on the fact that most microprocessor components are made in the "silicon valley" area just south of San Francisco: "Build your own computer with components from Silicon Valley."

You'll find the Silicon Valley stores at 23 Chandos Street, St Leonards, and at 380 Bridge Road, Richmond.

High-speed silicon switch — controls 20,000 amps!

Small silicon wafers capable of switching at rates above a million amperes in a millionth of a second may be one of the keys to the development of laser-activated thermonuclear fusion.

The Westinghouse Research and Development Center in Pittsburgh, Pennsylvania, is testing a major candidate for this high-speed switching task — a Light Activated Silicon Switch (LASS).

This experimental solid-state device is triggered with a pulse of infrared radiation, which provides very fast and efficient turn-on of a large semiconductor area. With light pipes, an array of light-activated switches could be simultaneously operated with a single infrared pulse.

To test the capability of the LASS device, a special test apparatus was constructed at the Westinghouse Research Center. The silicon device has demonstrated peak current pulses of 20,000 amperes, switched on at rates of 40,000 amperes per microsecond, and sustained for about 40 microseconds.

To give an indication of the development still required to satisfy the fusion application, the switching apparatus required to control a fusion-inducing laser will have to handle more than 10,000 times the power being switched today by this single LASS device.

The laser-initiated fusion concept considers the use of intense pulses of laser beams to rapidly compress small pellets of fusionable material to super-high densities and thermonuclear ignition. Present studies suggest that efficient (about 5 per cent) visible light lasers delivering about 10^{15} peak watts in less than 10^{9} second at repetition rates of 10 to 100 pulses per second would probably be required for an operable fusion power plant.

Newcastle dealership for Dick Smith

A full Dick Smith Electronics dealership, D.G.E. Systems Pty Ltd, has opened in Newcastle. The new store is situated at 103 Broadmeadow Rd, Broadmeadow (telephone 69 1625), and is part of a growing chain of Dick Smith stores and dealerships.

Managers of the new store are Geoff Linthorne and Dave McCauley. Dick Smith Electronics is prepared to discuss the opening of dealerships for any large centre in Australia, and interested persons should contact Gary Johnston in Sydney on (02) 439 5311.

Flight simulator for TAA

Redifon Flight Simulation Ltd of West Sussex, England, is to build a Boeing 727 flight simulator worth over $3 million for Trans Australia Airlines (TAA). The recent deal completes a hat-trick for Redifon, who now have three B727 flight simulators under construction. The other two are for Iraq Airways and Braniff International.

The TAA simulator will incorporate a six degrees of freedom motion system and the latest Redifon Computer Generated Image (CGI) visual system — Novoview SP1 — which provides dusk and night scenes for occupants of the flight deck. The on-board instructor's station will have advanced visual display units providing aircraft track and approach positions, as well as exercise control facilities. At the off-board instructional station, a similar display will provide data for an Air Traffic Control Instructor.

The simulator will be completed by mid-1979 and will be installed at the airline's flight training centre at Essendon.

W-F entertains the press

EA Editor Jim Rowe (left) listens to Kenneth D. Boyce of Intel Corporation, USA, at a recent luncheon arranged by Warburton-Franki for the technical press. Boyce was in Australia for W-F to talk on recent developments at Intel in the microprocessor and semiconductor fields.

Polish up your metrics, says Board!

The Metric Conversion Board has asked newspapers, magazines, radio and television to polish up their use of the metric system now that Australia's conversion program has reached such an advanced stage.

The Board has been approaching the various news organisations and broadcasting networks asking them to improve their metric usage so that it complies with the International System (SI) that Australia is adopting, and to ensure that the use of imperial units in broadcast and published material ceases as soon as possible.

The MCB's Director of Public Relations, Mr Gavin Handley, praised the co-operative and progressive approach adopted by the media towards metrication in the past seven years. He said the early use of metric units by the media helped to influence public acceptance of the new system.

The follow-up action was designed to eliminate inconsistencies and confusion resulting from having to cope with two measurement systems. Achieving this would undoubtedly help the public in assimilating metric concepts.

An MCB publication "Guidelines for Metric Reporting" has been distributed to all sections of the media, and provides practical information to help journalists convert from imperial to metric measurements, and also to avoid the pitfalls of incorrect usage. There are also sections in the booklet to assist specialist writers, e.g. for sport, motoring, finance and shipping and rural industries.

NEWS HIGHLIGHTS

Computer portrait!

This portrait of EA Editor-in-Chief Neville Williams is not a photograph. Instead, it is a computer portrait, drawn by a computer in a London department store during his recent overseas trip. The time taken by the computer? — less than half a minute!

Teletext for the deaf

Advances in electronics promise a fuller life for the deaf and blind, with devices that give them new means of communication.

The introduction of "teletext", in which requested information is displayed on the home television screen, will be of particular value to the deaf and hard of hearing. This has been pioneered in Britain, where a group of researchers and engineers have now got together to form a charitable organisation, called Deaf-fax, with the aim of providing teletext units for deaf people.

These units can be fitted to an ordinary television receiver and allow the user to pick up the new information services which are being run by the British Broadcasting Corporation and the Independent Broadcasting Authority, as well as the telephone linked service to be set up by the British Post Office. Deaf-fax hopes to be able to provide the deaf with the teletext service at a nominal rent by using volunteers to assemble the units.

New Association

Seven major suppliers of video equipment have formed the Video Suppliers' Association to improve the availability of information to retailers and the public generally on video equipment in Australia.

The inaugural president of the new association is Mr Bob McCallum, General Manager of AWA Rediffusion. According to Mr McCallum, the association was formed following a decision by suppliers to pool information on video equipment.

Help save our sound heritage . . .

Have you ever thought what happens to old records, to important radio broadcasts or to tapes of personal reminiscences? For instance, in October 1890, at the Centenary Hall in Sydney, several leading politicians and stage personalities recorded their voices on "Mr Edison's Improved Phonograph".

What did Nellie Stewart sing? We don't know. Nobody thought to preserve those fragile cylinders. They would be priceless today, but they were just a novelty then.

Despite what has already been lost, there are in Australia a number of important private sound collections, while the Sound Archive of the National Library in Canberra has been entrusted with the custody of some 260,000 records donated by individuals and institutions, and purchased from its special budget.

In addition to these discs, there are some 4,000 tapes and 4,000 cylinders — the lot amassed in just four years of operation.

But the National Library's Sound Archive is facing a serious crisis. It has inadequate staffing, inadequate premises, inadequate facilities and an inadequate purchasing budget.

The Archive is tucked away in a corner of the 4th floor of the Library, its third location in four years. Less than 10 per cent of the collection is housed on suitable shelving and only five per cent is catalogued. The rest is lumped waist-high in boxes and cartons in odd corners of the building and — worse — over 200,000 discs are stacked outside the library in a leaky storage shed.

Recording equipment is also hopelessly inadequate.

To help the Archive, a group called the Friends of the National Sound Archive has been formed. The aim is to promote the collection, preservation, documentation and accessibility of Australia's sound heritage.

The group is planning regular meetings in all states, and will be publishing a newsletter. You can become a member by sending $5 to the Secretary, Friends of the National Sound Archive, Box 4037, Melbourne 3001.

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It's the world's fastest growing industry... with new discoveries...new products every day. And, every day, there are more jobs...bigger salaries...better opportunities...for people who are trained.

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Your career opportunities are limitless...in broadcasting, industry, the military, aerospace programs, medical science and communications. With your enthusiasm and ICS tuition, a well paid job and a secure future in electronics is well within your grasp.

How do I get into it? ICS have put together a FREE Electronics Career Folder. It tells you all about the many courses open to you including Communications and Broadcasting, Industrial Electronics, Computer Servicing and Audio/Radio Servicing...courses endorsed by the Television and Electronics Technicians Institute of Australia. Post the coupon and the career folder will be on its way to you without obligation. Don't wait another minute...progress won't. The big developments in electronics are happening now and the demand for skilled people is growing all the time.

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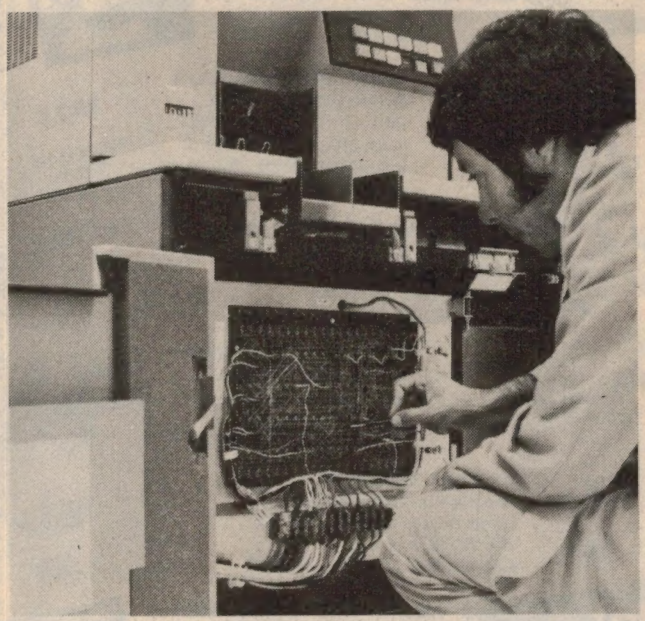

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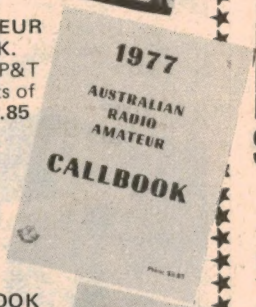

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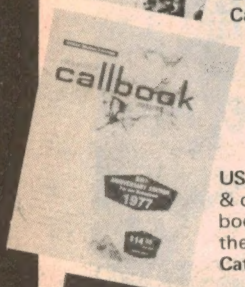

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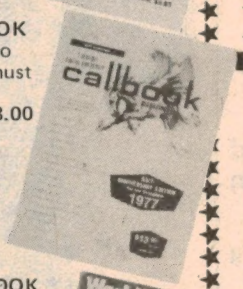

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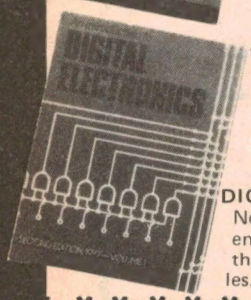

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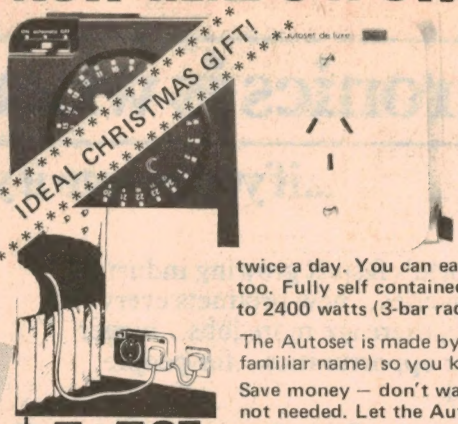

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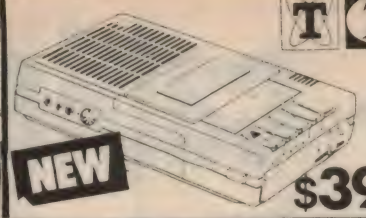

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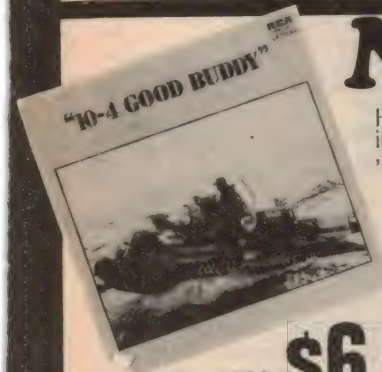

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CHY— cable radio success story

Cable radio has been well established in Britain, Europe and the United States for some years now. However, many readers will be surprised to learn that a cable radio station has been operating successfully in Australia for the last four years. The station, Radio CHY, is run by senior high school students, and has had a significant impact on the small north coast town of Coffs Harbour in NSW. Here we tell the story of Radio CHY.

The Sydney Opera House and Radio CHY, Coffs Harbour, have one thing in common — they both grew out of a hole in the ground. Above that level the similarity ends. The footings for CHY were dug in 3½ hours on Saturday, 12th August, 1972, and measured just six metres long by two metres wide.

How did it all begin?

Captain John Townsend of the Salvation Army and his family were on holidays in Brisbane when a letter arrived from Salvation Army Headquarters advising that they were to leave Gladstone in Central Queensland and take up a new appointment in Northern NSW by the end of January 1972. Sent to take command of the Salvation Army in the rapidly developing town of Coffs Harbour the captain had no thoughts of building a radio station.

During his first few months in Coffs Harbour, Townsend established a "Space Club" for boys and girls of primary school age. One night the children were invited to bring their favourite records from home to play "radio" by pretending to be disc jockeys. The experiment proved so overwhelmingly successful that the captain decided to build a small room at the rear of the Salvation Army property to be used as a "Communications Laboratory".

The proposal seemed straightforward enough to the Salvation Army Property Board and approval was given to erect a two-storey building using voluntary labour.

It seemed a pity to devote so much time and energy to a "Communications Building" that lacked an audience with which to communicate. Townsend recalled that Telecom telephone lines were used in Sydney for the distribution of "piped-music" programs. Why not employ the same system for a student radio station?

A letter, setting out the proposal, was dispatched to the Postmaster-General. The matter was duly considered by the Department and the Australian Broadcasting Control Board, and approval given to operate the service subject to certain conditions, viz:

(a) the service not carrying advertising material; and
(b) the preparation of a properly engineered proposal by the Salvation Army in association with the Post Office.

The government "green light" had been given!

As the building began to take shape an approach was made to the English Master of Coffs Harbour High School, Ed Gormley, to gauge his reaction to the proposal that secondary school students be invited to run a landline radio station. (By this time Townsend had realised that the project was way beyond the capacity of primary school students.)

Gormley realised that the idea had exciting possibilities. He took the matter up with the Department of Education and was delighted when they agreed to release students from school for one half day per month to participate in CHY. Another milestone had been laid!

It is true to say that CHY owes much

About radio station CHY . . .

- Radio CHY is the first cable radio station to gain official approval to operate;
- The program is fed by Telecom line to the Coffs Harbour telephone exchange after suitable compression and line isolation;
- The signal at the exchange end goes into a "splitting amplifier" which allows distribution of the program to subscribers;
- CHY operates 16 hours per day, seven days a week, 52 weeks a year. Broadcasting commences at 6.00 am and ceases at 10.00 pm;
- Over 100 secondary school students provide the announcing team needed to maintain the high level of program output;
- CHY is in the business of training announcers. To ensure that there is an adequate supply of qualified announcers, a training program is continuously operated

of its origin to the enthusiasm of a small group of students from Coffs Harbour High School. Brought together to form the nucleus of the station, they quickly set about to fan life into the project.

The first step was to swell meagre finances by holding an "Announcethon" in the window of Waltons department store. Andrew Couchman felt tired but triumphant when he emerged from the store after clocking up 50 hours of nonstop announcing.

The students worked tirelessly for seven months with the result that the nation's first student-run cable radio station was officially opened on 1st December, 1973.

Enter Rodney Swansborough. Swansborough was a member of the English staff of Orara High School when approached by John Townsend to join CHY. Motivated by curiosity and the challenge of a unique innovation, he readily accepted the invitation to spend his spare time in CHY.

Swansborough's knowledge and understanding of students proved advantageous. He quickly came to the rescue when a crisis developed over the allocation of student announcing shifts. Some students were being grossly overworked. A vigorous recruitment campaign was set in motion and a disaster averted.

Community goodwill and generosity had provided the basic capital resources that covered a vacant patch of grass with a broadcasting studio. However, the immediate challenge facing the management of CHY was how to develop a legitimate means of funding that would provide for the day-to-day operational expenses of the station.

The Broadcasting Control Board had insisted that the station should not broadcast advertisements. Fortunately the Control Board, with customary thoroughness, had defined "advertising" in one of their Program Standard's publications. Section 37 of "Television Programme Standards" (1970) stated: *"The term advertisement does not include the brief announcement of a sponsor's name and business at the beginning and end of a program which is scheduled for a duration of not less than 15 minutes . . ."*

It provided the solution to CHY's fund-raising dilemma. The Board and Telecom gave approval for the station to broadcast sponsorship announcements, and this has remained the means for the raising of revenue ever since.

Technical problems retarded the early growth of the network. Prior to the opening of the station Telecom had introduced stringent regulations governing the attachment of electrically powered equipment to Departmental landlines. In order to comply with these regulations CHY had to design a protective interface unit and gain approval to connect it across Telecom lines.

The Department was sympathetic to the plight of the student broadcasters and managed to locate an engineer named Trevor Smith who accepted the challenge and designed a satisfactory unit, appropriately called a "Smithlab". The CHY kids hailed him as an instant hero. Six months after the official opening additional listening outlets were added to the Network.

Technical help came from other quarters, too. Paul Linsley was in Albury when he first heard about CHY. He hitch-hiked to Coffs Harbour and placed his technical skills at the disposal of the station. Two Sydney radio stations (2SM and 2UE) had previously donated valve-powered AWA Consolettes to CHY, but it took the patience and ingenuity of Paul Linsley to adapt them to CHY's needs. Paul stayed in Coffs for about nine months and proved a great asset to the station.

The government wasn't to be outdone either.

"We've got the grant" said Rod Swansborough as he put down the telephone, his face covered with a $25,000 grin. The Australian Government Karmel Schools Commission had approved an Innovations Grant to CHY. These funds opened the way for CHY to be technically refitted with modern broadcasting equipment. The grant also provided for the establishment of an "Educational Network" which would link all schools in Coffs Harbour to their private network for the transmission of locally produced educational programs.

The station had come of age!

This (second) network is available to the schools within Coffs Harbour during school hours. The s

Student announcer Linda Hill in CHY's main production studio.

"In theory CHY is a student-run cable radio station. In reality it is a composite of personalities, a friendly meeting place . . . and a direct stimulus for heads filled with ideas."

—student announcer Milli Nord

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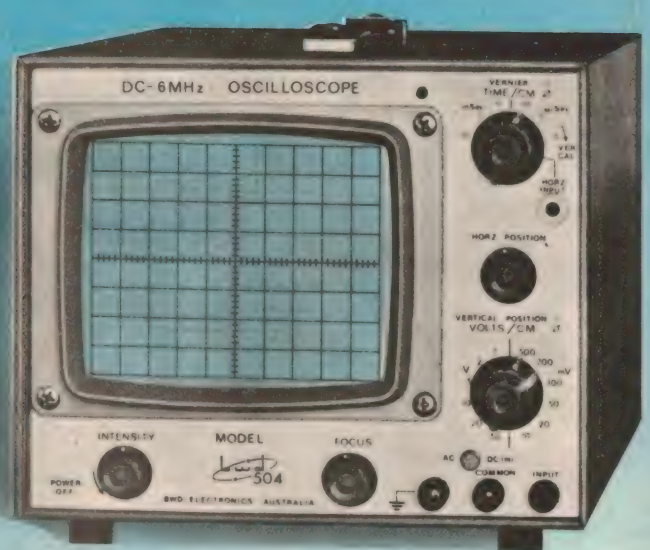

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CHY — cable radio success story

currently connected to the network receive programs via the CHY studios and have all participated at some stage in their production. The Second Network is able to involve every school child in Coffs Harbour and environs in CHY's activities and make available to them the station's professional studio and recording facilities, its extensive record library, plus the experience and expertise of the CHY personnel.

Excursions from schools throughout the North Coast region are conducted regularly through the CHY complex. CHY staff also visit the schools within the Coffs Harbour area as well as travelling further afield offering advice to other schools and groups interested in setting up similar projects.

By the end of 1974 CHY had grown from infancy to late adolescence. The Salvation Army reviewed the progress of the station and came to the conclusion that it was impossible for John Townsend to run both the station and the Corps (Parish). They decided that another officer should be sent to run the Corps and that Townsend be appointed full-time to Radio CHY.

Following the implementation of the Karmel Schools Commission Grant the NSW Department of Education assessed the educational potential of CHY and decided to appoint a secondary school teacher to supervise all student and educational activity. Rod Swansborough, an obvious choice, got the job. The stage was now set for real growth and consolidation.

The need for additional full-time staff became very obvious early in 1976 but it wasn't until later in the year that the much needed help arrived. The mild-mannered Ian Stevenson, complete with technical skills and an analytical mind, vocationally adopted CHY and within a short space of time had the technical facilities of the place finely tuned. And Bronwyn Bell, vivacious and indefatigable, moved out of Coffs Harbour High School with the ink still wet on her School Certificate to turn her part-time job as student Program Manager into a full-time career.

The extent to which Radio CHY has been accepted as an integral part of the life of Coffs Harbour is self-evident from the number of landlines now extending into business and recreational premises in the town — over 30 at last count. Included are theatres, shopping malls, seven motels, supermarkets, pharmacies, small businesses, and even a banana packing shed!

A student announcer broadcasting from the window of Walton's Department Store, Coffs Harbour. CHY has been well accepted by the business community.

The record library provides an ideal setting for programming discussions.

Yet the future of CHY remains clouded in doubt. The substantial costs associated with the installation of cable into private homes impose severe limitations on the natural growth of the network. CHY listeners cannot understand why the station does not broadcast like a conventional radio station. One of the continuing disappointments of the students involved with CHY is that they are unable to listen to the station at home.

Radio CHY's quest for an "on-air" broadcasting licence has been plagued with broken promises and bureaucratic ineptitude. Both Labor and Liberal Governments have recognised the value and viability of this community-media operation, having on many occasions conveyed their support to the CHY management for the acquisition of a Broadcasting Licence for CHY.

As a result Radio CHY has been on "stand-by" for the past three years ready to commence broadcasting. CHY has the necessary administrative and programming experience, technical equipment, and proven financial viability, as well as wide local community support. All it now awaits is a decision from the Federal Government and the Licensing authorities.

TANDY: more than just a chain of stores

When most people invest in a piece of electronic equipment they tend to take it for granted that the firm from whom they bought it will stand by the product — provide a warranty period, service facilities, and a stock of spare parts. But is such an assumption always valid? And when it is, do they ever stop to think about the organisation behind such back-up facilities?

by PHILIP WATSON

It is true that most organisations will stand by the product they sell, if only for the reason that they are jealous of their good name and reputation; the reputation on which they depend for continued custom. But it is unwise to automatically assume that any product you buy is so protected. The wise buyer will make sure that such protection is spelled out in detail.

This is particularly important when items are offered at "bargain" prices by organisations of doubtful background. One of the ways to offer a lower than normal price is to simply retail the items with little or no back-up; doubtful warranty in the event of premature failure, and no provision for spare parts or service facilities when these are needed.

The simple fact is that providing such services costs money, and this cost is inevitably reflected in the price of the product. So, we can have a cheap product without any back-up, or a more expensive one with back-up; most people prefer the latter.

To get some idea of what is involved in providing such back-up facilities, we accepted an invitation to visit the head office of the Tandy organisation in the Sydney suburb of Rydalmere, NSW, and inspect their service and spare parts facilities.

The Tandy organisation commenced operation in November 1973 with three stores, and has since experienced a remarkable growth rate. It now has 109 stores throughout Australia, and is still expanding. The stores carry a large range of electronic items, from minor components and accessories to audio amplifiers, receivers, transceivers, tape recorders, etc.

All the items they sell carry a warranty. In the case of major items, the warranty details are included in the owner's manual. In the case of minor items it is an automatic 90-day warranty, the details of which are normally displayed on a poster in every Tandy store.

Their warranty, incidentally, is virtually worldwide. If a customer purchases a Tandy product in say, England, while on an overseas tour and, on arriving back in Australia, finds that it needs attention, then this will be available at the nearest Tandy store. All that is necessary is to produce the sales docket from the store where it was purchased.

Our visit was organised by Mr Gordon Heyes, quality control manager for Tandy in Australia. And, as we quickly learned, his department is concerned with a lot more than simply ensuring that a product can be serviced after the customer receives it. In fact, as the term "quality control" implies, the primary aim of the department is almost the opposite: to ensure that the customer doesn't need service after he or she buys the product. But if service is needed, they are fully equipped to provide it.

Opposite page: Mr Tomo Yamamoto is Tandy's resident electronics engineer. Using this well equipped test bay he checks the quality of each shipment from Asian contractors. Above left: Part of the computer system which is about to take over the stock and other routine records of the quality control department. Above right: Spare parts by the thousand! This is just one of several large component storage bays used to back up the warranty and service facilities. An effective stock control system provides immediate access to any component.

While about half of Tandy's products are manufactured in one of the company's 16 factories located around the world, certain items such as audio equipment, receivers, transceivers, etc, are made under contract by other manufacturers, mainly in Asia. And this is where the quality control starts — with the drafting of specifications and letting of the contract to a particular manufacturer.

Before such a manufacturer is given the go-ahead for large scale production he is first required to make a number of sample models. These will vary slightly, according to the market for which they are intended — i.e., USA, Europe, Australia, etc. Mains operated devices, for example, intended for the European or Australian markets must be suitable for 220V to 250V operation, rather than 110V as in the USA. Also frequency conscious devices such as turntables must be suitable for 50Hz rather than 60Hz.

Over and above that, Australia, and most European countries, have very strict standards for mains operated appliances. In Australia, for example, appliance transformers are required to use double bobbins to separate the primary and secondary windings, in the interest of maximum safety.

The power cord must also conform to local requirements. If it is a two wire cord it will be accepted only if the insulation of the appliance itself meets the necessary requirements. Otherwise a three wire cord must be fitted and, in either case, must be terminated in a standard three pin plug.

One of these samples is sent to each area and, in fact, one arrived in Mr Heyes' office while he was explaining this procedure to us. It was a very attractive portable stereo cassette recorder with AM/FM tuner, which the company plans to market as soon as all tests are completed.

This sample had already been evaluated by a Tandy engineer on duty at the contractor's factory, and his written report accompanied the sample. It amounted to several pages of performance figures, reports, comments, etc.

As well as the electrical performance tests it would have been submitted to extremes of temperature in ovens and refrigerators, far exceeding those likely to be encountered in practice. It would also have been given a vibration test and a drop test, the latter in the type of transport package normally employed.

At this point, the firm might be excused if they accepted the findings of their overseas engineers, and simply evaluated the product on its general appeal to the local market. In fact, the entire electrical performance will be checked, as will its mechanical condition following the journey from overseas.

For this purpose a very comprehensive test bay has been set up, equipped with a high performance CRO, audio generator, HF generator, VHF generator, UHF generator, meters, etc, to enable the local test engineer to match the tests made by his opposite number overseas.

To facilitate communication with Asian contractors, Tandy employs a Japanese engineer to conduct or supervise these tests. This helps overcome language barriers which can otherwise create quite serious problems where complex technical matters have to be discussed.

Mains operated equipment will also be voluntarily submitted to the appropriate Australian power supply authorities to ensure that it meets their safety specifications.

When this model has been fully evaluated a report is sent back to the contractor and the Tandy engineer, who supervises whatever modifications are required.

The next step is a trial production run, the previous models having been constructed by skilled technicians rather than normal production line staff. Such a production run may involve 20 or 30 units, and a small quantity is sent to each market area. Australia, for example, may get five units.

Again these are evaluated, this time to detect any problems arising from mass production techniques. Only when this batch is given a clean bill of health is the contractor given the go-ahead for a full scale production run.

During the production run the Tandy engineer remains on location and continually checks samples taken at random from stock waiting to be shipped. Naturally, any fault pattern which emerges can be quickly rectified and, if it is sufficiently serious, stocks can be frozen until all units are checked.

TANDY SERVICE

When a shipment finally arrives in Australia it is subject to yet another check. This is a random check involving, initially, about 10 per cent of the shipment. The amount of subsequent checking depends very largely on the result of this check. If it was 100 per cent correct, for example, there would be little point in further checks. But if a serious fault pattern emerges, it may be necessary to check all stocks.

In such an event the necessary corrections would normally be made by the quality control department's staff, with the cost being met by the contractor. If the volume of work involved should be beyond the capacity of the local staff to cope with it in a reasonable time the contractor may elect to send out the necessary staff, rather than recall the entire shipment.

Incidentally, these checks are not concerned only with the performance and condition of the equipment itself — the whole package is evaluated. A missing owner's manual or accessory can be just as frustrating to the customer, and as embarrassing to the quality control department, as a major technical fault.

Nor is the quality of the owner's manual itself taken for granted. We have all encountered manuals written in what has come to be known as "Asian English", quaint combinations of English words which at times can be almost meaningless.

I raised this point, and Gordon Heyes' answer was to pick a manual at random from a nearby stock shelf and say, "Here, see for yourself." A quick check was enough to convince me that, regardless of who drafted the text in the first place, it had been edited by someone with a full command of English.

At this point one may fairly ask just how effective this overall checking system is in practice. Does it mean, for example, that a customer can never get a faulty appliance? Gordon Heyes is the first to admit that such a claim would be quite unrealistic. "But," he claims, "putting aside nuisance calls, such as the customer pressing the wrong buttons, we do keep our warranty claims under one per cent. In fact, if we experienced a figure of one per cent, it would set the alarm bells ringing, because we would know something serious was wrong."

Of course not all service calls are under warranty or imply faulty design or workmanship. Some things, like tape recorder heads, drive belts, etc, wear out in the normal course of events. Also equipment is damaged, either by mechanical or electrical abuse. When these problems occur, the owner is naturally concerned about getting his gear going again.

And this is where the other end of the quality control department takes over. It is in fact a service department in its own right, but there are significant advantages in having it under the one administrative control. Among other things, it provides a valuable source of information concerning any distinct fault patterns which might occur, and which should be fed back to the production line. Gordon Heyes feels that too rigid separation of departments can inhibit such feedback.

Another aspect of the service end of the department is maintaining a stock of spare parts, without which any service department would grind to a halt. This is a significant operation in itself, involving many racks of shelves and many thousands of bins, all carrying individual spares. The bins must be effectively indexed to provide immediate access to a particular part, and an extensive stock control system is needed to keep them supplied.

Again, according to Gordon Heyes, there are advantages in a single administration. One example is the need to regularly re-order spare parts, keeping in mind the conflicting requirements that, on the hand it is undesirable to carry more stock than is strictly necessary but, on the other hand, important to maintain enough for immediate needs.

The service department provides the most valid information as to the rate at which particular spares are being used, plus any additional information regarding the quality of the spares, or the possible need for modifications in some instances.

Spares are dispatched with each new shipment of appliances, the proportion of individual items being based on experience gathered from the previous shipments. Normally this is sufficient to provide adequate stocks but, understandably, there is sometimes a run on a particular component, such that it is in danger of running out before the next shipment.

In such cases a telex message would be dispatched to the company's head office in Forth Worth, Texas, and the items would be dispatched by air freight. However, there have been situations where the department has stripped down brand-new appliances to provide a stock of urgently needed spares, rather than subject their customers to undue delays.

Talking of spare parts raised the inevitable question as to how long such spares can be stocked for a particular model. "Our policy," said Gordon Heyes, "is to stock spare parts for at least five years after our last shipment of a particular model. Sometimes this is outside our control, as when a manufacturer goes out of business prematurely, but it is our policy and we do our best to follow it."

The service department proper con-

One of several well equipped booths which form the service section of the quality control department. In this case the technician is working on a cassette tape deck, but the next job may involve the output stage of a transceiver.

sists of several well equipped test booths, plus the necessary inwards and outwards departments, clerical staff, etc. It handles all the service for NSW, and there are similar departments in Brisbane and Melbourne.

In the event that a customer needs service, whether under warranty or not, he need only take the device to his nearest Tandy store, preferably the one from which he bought it. All the details of the complaint are noted on a suitable docket and the device forwarded to the Rydalmere depot.

At the same time the store concerned can give the customer a fair estimate of what the repair will cost, assuming it is no longer under warranty. Tandy employ a novel flat rate labour costing system, whereby the labour cost is a fixed amount for any particular piece of equipment. This is regardless of the time actually taken for the job; if it turns out to be a stinker, that is the company's bad luck. Hopefully, the next one will be a pushover!

The minimum labour charge under this scheme is $7.50, and the maximum charge, for the most complex piece of equipment currently on their list, is about $17. To this will be added the cost of any components which need to be replaced and, while this charge is not completely predictable, it is more often than not quite modest.

After being serviced at Rydalmere the equipment is returned to the shop from which it came, and the customer is advised by telephone that it is ready.

At this point of our discussion I could not resist raising one point. In any system like this the line of communication between the customer, and the service mechanic on the bench, tends to be stretched to its limit. Suppose the fault is intermittent, or environmental, and does not show up on the bench?

I was assured that everyone was well aware of this risk, and that they are geared to avoid it. At the store end of the line the staff are trained to elicit as much information as possible from the customer concerning the symptoms, and these are recorded on the service docket.

At the service bench end of the line the technicians are trained to watch for just this problem. If the symptoms they observe on the bench do not seem to tally with those on the docket, or if they can find no fault, then the customer must be contacted with the request for further details of the symptoms. If necessary, arrangements can be made for him to demonstrate the symptoms at some mutually convenient site.

Earlier we mentioned the need for an effective stock control system to maintain the spare parts at an adequate level. In addition, there is a fair amount of clerical work required in any service department, including the costing of components and labour for each job, interdepartmental billing, and so on.

To date this has all been done by hand. However, the department has now grown to the point where it would be more economical to computerise the system. In fact, the computer already exists within the Rydalmere head office complex, where it is used for the much bigger jobs of main stock control, accounting, payroll records, etc. It can also be connected into the Forth Worth computer in Texas, via an international circuit, for exchange of information.

So plans are now under way to bring the quality control department into the computer system. It will obviously involve a fair amount of work to transfer everything to computer records, while ensuring that the flexibility of the department's current working systems — which have proved themselves — are not impaired. But Gordon Heyes is confident that it can be done and that it will significantly improve the efficiency of the department.

One of the jobs, for example, will be to provide an automatic ordering system. It will monitor the inventory level and, when a predetermined minimum quantity is reached, it will print out a purchase instruction.

And, of course, the computer is an ideal device to provide the kind of statistical information which is so valuable in a department of this kind; the rate at which individual spares are being used (is there a weakness in a particular component, about which the contractors should be informed?), the rate at which particular products are being repaired under warranty (again, is there a pattern?), or even the effect which seasonal changes have on service demands, for whatever such information may be worth.

One thing it won't replace, however, is the enthusiasm and team spirit which operates within the department, and of which Gordon Heyes is justifiably proud. "Our job," he said, "is to ensure that Tandy has satisfied customers. If a customer has a complaint, we will bend over backwards to put it right whatever is wrong. And, while our warranty spells out strict legal conditions, for our own protection, we are not above exercising our discretion in borderline cases, or where a strict interpretation is obviously inappropriate.

"In fact," he went on, "this department is not even expected to show a profit; more usually, it runs at a loss. The service it provides is part of what the customer pays for when he buys the product."

On the technical side it is obvious that most of the staff have a genuine interest in electronics over and above their job. Most of them have an amateur radio licence at one level or another, and others are studying for their licence. And although that may not automatically guarantee a good technician, it isn't a bad place to start from.

According to Gordon Heyes, each technician is expected to be able to tackle any of their appliances, and to be equally at home with the mechanics of a tape deck or the output stage of a transmitter. On the other hand, they are not above pooling their knowledge and experience should a particularly sticky problem arise. If necessary, the Japanese engineer can be called on for additional assistance.

From all this there is little doubt that the Tandy organisation takes its responsibilities to its customers seriously; certainly as seriously as most other organisations, and possibly more seriously than some. And not only because it stands behind its product after it is sold but, as much as anything, because it strives to make such after sales service unnecessary — though no less available for all that.

So next time you contemplate a "bargain" price think carefully about what you will get for your money. Buying from a reputable organisation may cost a little more, but it could mean a lot more in real value.

The Measurement Challenge

In Electronic Technology

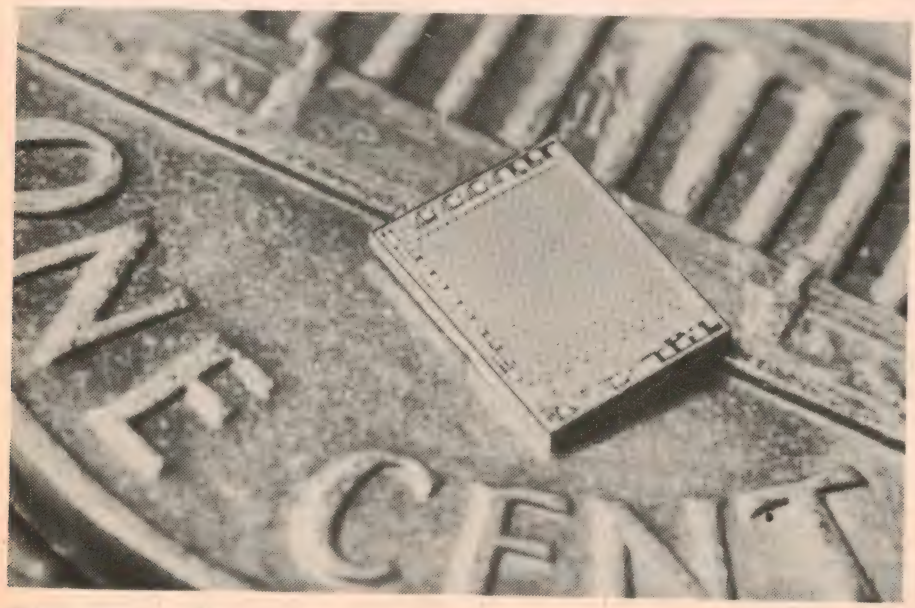
Rapidly advancing semiconductor technology has outdistanced traditional measurement technology. Now for a variety of safety, economic and technological reasons, new measurement techniques must be developed for the semiconductor industry. For the US, the development of new techniques is vitally important if the country is not to lose its military and economic ascendancy.

by JUDSON C. FRENCH*

Is the United States losing its technological leadership? That question is being raised frequently. At the EASCON meeting of the Institute of Electrical and Electronics Engineers last fall, a panel of experts concluded that the country is in serious danger of doing so. Their examples of US failures to be competitive internationally in the manufacture of certain electronic components and circuits were startling.

Many other leaders in industry and government have expressed similar concern not only about the loss of technological leadership, but also about the loss of economic and military leadership, both dependent on technological ascendancy. For example, members of management in 13 electronics companies unanimously agreed that a problem exists—a problem not in creativity but in how to make things better from a standpoint of productivity and quality. They cited semiconductor technology as one area requiring careful attention.

*Chief or the Electronic Technology Division, NBS Institute for Applied Technology.



This tiny semiconductor is a complex maze of transistors on a single integrated circuit chip. Rapid advances in the design of integrated semiconductor devices like this have made today's computers possible.

One of the major factors in the expansion of electronics into industrial, consumer, and government application is the rapid development of semiconductor components on which most electronic "systems," from cardiac pacemakers to computer networks, now depend. Active electron devices, such as semiconductors, largely make possible, and also limit, the capabilities of such systems. As go components, so goes the system.

Silicon-based semiconductors have been the pacesetters for years and will continue to be so for the foreseeable future. Other technologies are important in special cases, but comments involving silicon devices as an example will apply equally well to them.

The measurement problem in this field can be summed up by saying that despite (or perhaps because of) the sophistication of semiconductor technology, the measurement methods available to control materials and equipment as they enter and are used on a production line, and the measurement methods to characterize the finished product, are all too often not sufficient to meet the needs of the supplier or the customer. Semiconductor technology has outdistanced traditional metrology (measurement technology). This is true across the board, from chemical measurements, through dimensional metrology, to electrical tests.

Hundreds of companies confront this problem to an increasing extent in US industry. Manufacturers of products as diverse as computers, cameras, automobiles, cardiac pacemakers, and electronic instruments now make these semiconductor components in-house for economic and competitive reasons. These companies must interface with the thousand suppliers of materials and equipment needed for semiconductor manufacture and must control the manufacture of their own products and characterize them, perhaps even more carefully than must the merchant manufacturers of devices.

Many persons today are familiar with

the development of tiny, complex integrated circuits that contain thousands of individual transistors on a silicon chip only a few millimetres square. These devices already require crystal purity and perfection, purity of processing gases and chemicals, and dimensional controls for photolithographic processes far beyond those of other production processes. In insulating oxide layers or in active regions of silicon, quantitative identification of dopants and contaminants, in the parts-per-million to parts-per-billion range, and of their distribution over fractional micrometer dimensions are required. Most of the physics of a device takes place within a micrometer or so of the surface!

In the future, the dimensions of entire transistors will approach a wavelength of light to meet, for example, computer requirements for increased speed and reduced power consumption in each logic function. The metal-oxide-silicon transistor of the future may have less than 200 dopant atoms in its 150 nanometer-long control channel. It may be manufactured using electron beam exposures of new polymer materials to define working areas, with its dopants introduced by ion implantation techniques. The control measurements for all of these processes must be economically feasible on a manufacturing line.

But there are already problems with the control measurements, even today before these extremes in design requirements are reached. Successive, even alternate silicon wafers in a single diffusion run may have high or zero yield of devices, for unknown reasons. Processes which are more art than science go out of control and, lacking quantitative control over the materials involved and the processes themselves, the panic button is pushed.

An enormous amount of frantic empiricism begins as the lost art is redeveloped and the process re-established. Procurement experts write specifications on hermeticity and water vapour content of devices, for example to achieve reliability, but satisfactory test methods are not available. Those responsible for safety in large systems complain that there is no adequate way to electricaly test individual elements in complex microcircuits such as microprocessors. And so it goes.

These are not simply matters of routine economic significance, hopefully to be solved by each company as a normal cost of doing business. They mean more to the US as a whole, and to the taxpayer than that. Not only are they of concern with respect to US international technological leadership, but they are of concern to military and civilian users of electronics.

The Department of Defense (DoD), long a leader in understanding the advances to be gained from the use of electronics, is much concerned about the cost of doing business with a high dependence on electronics. Electronic maintenance costs the Pentagon over $5 billion per year. Accident costs have risen as the result of failures of increasingly complex computers and components. DoD's ability to purchase custom, reliable devices to provide the competitive edge it requires for US national defense had led it to conclude that new attention must be given to improve measurement methods in manufacturing processes for two primary reasons: so that reliability can be built into devices made in the large quantities that provide economy-of-scale, and so that devices can be designed and built in modest quantities and still be both reliable and affordable.

The significance of similar problems in the civilian sector is only beginning to be appreciated. There the impact will be felt in the ability, safety, and economy of such large-scale applications as automobile electronics, computer controled systems, and medical instrumentation.

Instruments that are meaningful, repeatable, and economical are needed for control on the production line. They must be backed up by specifications and tests and standards covering the material and equipment coming into the line, and they must be followed by screening tests on the finished product and by incoming inspection by the customer. Everyone claims to know all this and even to practice it. So what is the problem?

Three points can be made in answering this question.

The first is that some practical measurement needs cannot be met because basic quantitative measurement technology is not available, even in standards or research laboratories.

As an example, consider the control that is necessary of dopants and contaminants in the micrometer-sized working region of a transistor. Quantitative measurements, backed up by standards, are not available to provide this information, despite the advent of powerful qualitative methods such as ion microprobes and other surface analysis tools.

The Electronic Technology Division of NBS is attempting to provide a start in this direction, in work supported by the

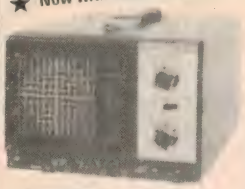
This photograph graphically illustrates the measurement problems of modern electronic technology. Shown are computer memory transistors so small that eight of them on an integrated circuit will fit in the cross-section of a human hair. Electron microscope photo (10,000 times enlargement) shows the V-shaped third-dimension of the VMOS transistor process. (Photo courtesy of American Microsystems Incororated, Santa Clara, California.)

TEST INSTRUMENTS

TRIO

CO-1303D
75mm OSCILLOSCOPE

★ Now with 5MHz bandwidth. ★

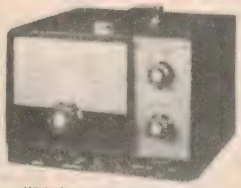


- 75mm CRT
- DC-5MHz/10mV
- Compact & lightweight

• SPECIFICATIONS

Bandwidth:	DC to 5MHz (−3dB)
Deflection factor:	10mV/div
Attenuator:	1, 1/10, 1/100
Input R,C:	1MΩ, 35pF
Sweep ragne:	10Hz to 100kHz
Phosphor:	P31

SG-402
RF SIGNAL GENERATOR

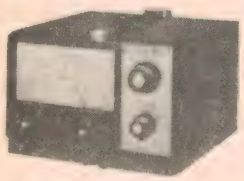


- Wide frequency range
- Compact
- Amplitude modulation facility

• SPECIFICATIONS

Frequency range	100kHz to 30MHz in 6 ranges
Output voltage	0.1 V rms
Int. Mod.	: 400Hz, 40% modulation
Ext. mod	1.5V rms, 50Hz to 10kHz

AG-202A
CR OSCILLATOR



- Wide frequency range
- Sine and square wave signals
- High output stabilized voltage

• SPECIFICATIONS

Frequency range	20Hz to 200kHz in 4 ranges
Output impedance	600Ω
Output voltage	Sine wave: 10V rms, Square wave: 10Vp-p

15MHz CS1560A
If you need more bandwidth-
The 15MHz dual trace

★ In fact we found the CS-1560 a delight to drive and use. It has the full 15MHz bandwidth available at deflections up to 6cm and maximum sensitivity of 10mV/cm. Traces are bright and sharp and waveforms with fast risetimes are easily viewed. The whole unit appears to be a well-conceived piece of equipment. We can recommend it for laboratory or hobbyist use. E.A. Dec. 75. ★

CS-1560A
130mm DUAL TRACE TRIGGERED SWEEP OSCILLOSCOPE

- 130mm CRT
- DC-15MHz 10mV
- Automatic sweep (AUTO FREE RUN)
- Display modes (CH1 CH2 DUAL ADD SUB)
- Full sensitivity X-Y operation

• SPECIFICATIONS

Bandwidth	DC to 15MHz (−3dB)
Deflection factor	10mV/div to 20V/div
Input R,C	1MΩ, 22pF
Risetime	24nsec
Overshoot	Better than 3%
Sweep time	0.5μs/div to 0.5s/div
Magnifier	x 5
Linearity	Better than 3%
Calibrator:	1Vpp (1kHz square wave)
Intensity modulation	More than 20Vpp
Phosphor:	P31
Power:	AC 100/120/220/240V 50/60Hz, 23W
Dimensions	W260 x H190 x D385 (mm)
Weight	8.4kg

BEST VALUE

10MHz CS1562
Dual Trace, Triggered Sweep

CS-1562
130mm DUAL TRACE TRIGGERED SWEEP OSCILLOSCOPE

- 130mm CRT
- DC-10MHz/10mV
- Automatic sweep (AUTO FREE RUN)
- Full sensitivity X-Y
- Display modes (CH1 CH2 DUAL)

• SPECIFICATIONS

Bandwidth	DC to 10MHz (−3dB)
Deflection factor	10mV div to 20V div
Input R,C	1MΩ, 22pF
Risetime	35nsec
Overshoot	Better than 3%
Sweep time	1μs div to 0.5s div
Magnifier	x 5
Linearity	Better than 3%
Calibrator	1Vpp (AC line freq square wave)
Intensity modulation	Less than 5Vpp
Phosphor	P31
Power	AC 100/120/220/240V 50/60Hz, 20W
Dimensions	W260 x H190 x D375 (mm)
Weight	7.0kg

CS-1559
130mm TRIGGERED SWEEP OSCILLOSCOPE
10MHz Single

30MHz CS1570
ANOTHER SENSIBLY PRICED SCOPE

CS-1570
130mm DUAL TRACE TRIGGERED SWEEP OSCILLOSCOPE

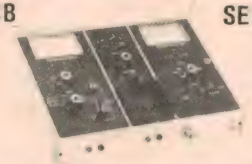
- 130mm mesh PDA
- DC-30MHz/5mV
- Delay line
- Auto level triggering
- Display modes (CH1 CH2 DUAL ADD)
- Trigger modes (AC LF-Rej HF-Rej DC)

• SPECIFICATIONS

Bandwidth	DC to 30MHz (−3dB)
Deflection factor	5mV/div to 5V/div
Input R,C	1MΩ, 24pF
Risetime	11.7nsec
Overshoot	Better than 3%
Signal delay	160nsec
Polarity	CH2 can be inverted
Sweep time	0.2μs/div to 0.5s/div
Magnifier	x 5
Linearity	Better than 3%
Calibrator:	0.5Vpp (1kHz square wave)
Intensity modulation:	More than 5Vpp
Phosphor:	P31
Power:	AC100/120/220/240V 50/60Hz, 25W
Dimensions:	W260 x H190 x D375 (mm)
Weight:	8.5kg

B+K PRECISION

MODEL 1040 CB SERVICEMASTER



- Greatly simplifies all CB transceiver servicing.
- Checks complete CB transceiver performance in minutes.
- Checks AM and SSB
- No complex hookups or calculations required.
- Test results displayed on direct reading meters.
- Only one hookup required for all tests.
- Eliminates need for special equipment.
- Increases your CB service profit by saving you time.

MODEL 1827 30MHz FREQUENCY COUNTER

- 30MHz reading guaranteed. 50MHz typical—
- Full 6-digit display with range switch allows 8-digit accuracy.
- 1Hz resolution—even at 30MHz and beyond.
- Completely portable for use anywhere.
- Exclusive battery saver features auto-shutoff of display to reduce battery drain.
- Operates on AA size batteries, AC with optional charger/adaptor or 12VDC with optional power cord/adaptor.
- Complete range of optional accessories for unequalled versatility.

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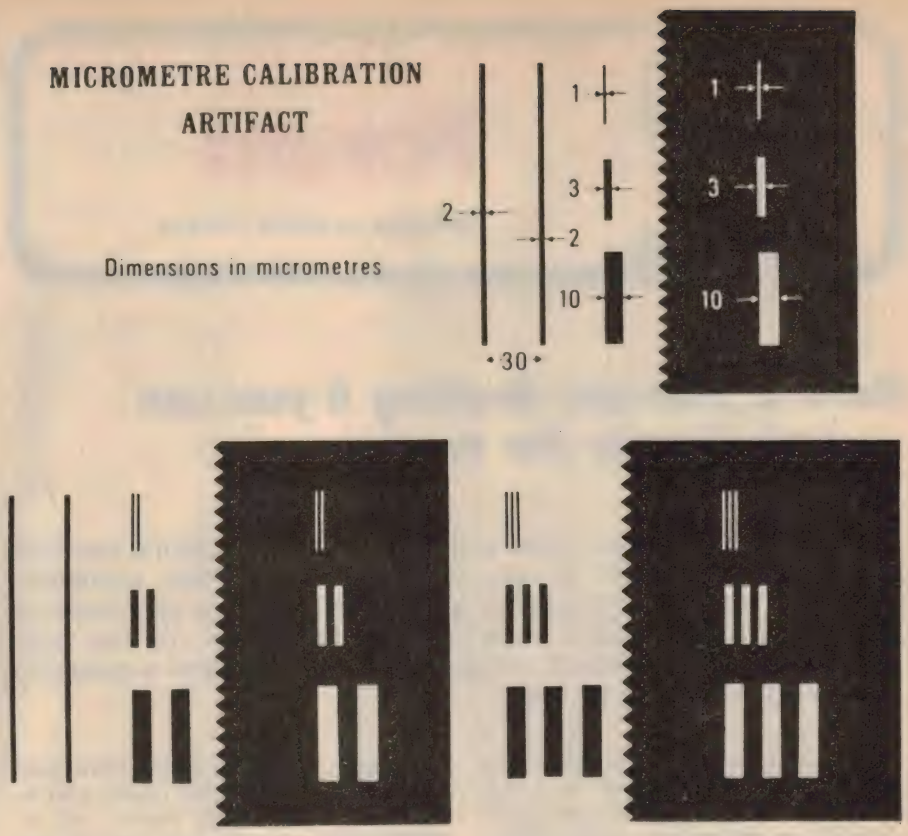
PARAMETERS PTY LTD

The Measurement Challenge



Schematic of NBS artifact for calibrating optical-microscope systems for measuring line widths.

DoD's Advanced Research Projects Agency (ARPA) that is aimed at providing artifacts of known chemical content. These materials are produced in a silicon matrix by the same photolithographic processes and ion implantation used in making semiconductor devices. They are defined in content by independent analytical means (neutron activation) applied to companion samples.

The second point is that some practical needs are not being met because of gaps in the traceability chain, gaps which may occur near either end of the chain—on the production line or at NBS.

As an example of the former, consider the use of a test instrument duly calibrated by the in-house standards laboratory and traceable to the standard volt. The rub is that a fixture has been added by the user between the instrument and the device he is testing, and he and his customer cannot understand why they always disagree. What is lacking is some standard artifact for checking out the whole measurement system.

As an example of a break in the chain occurring at NBS, take the measurement of linewidths in a photomask used in patterning the structures in a semiconductor device. Five to twenty steps in the manufacture of a device require photomasks. Absolute dimensions on each mask, uniformity across a mask, and registration of the image on the device structure from masking step to masking step are required to tolerances of the order of fractions of a wavelength of light. Poor control of line width can adversely affect device yield. It certainly can effect marketplace exchanges of photomasks. Several million photomasks are used a year by semiconductor device manufacturers, and untold millions of masking operations are performed.

Photomasks are sold by over two dozen small companies to device manufacturers. Photomasks are also made and used by the device maker and exchanged between the in-house maker and user. In either case the problem is similar: inability to agree on the measurements because the measurements cannot be standardized yet. What is needed now is a measurement standard for line width of one micrometer plus or minus 50 nanometers and the optical technology for properly using it.

Soon, the need will be for fractional micrometer standards. NBS has not been able to make these measurements. Line separations, yes; linewidths, no. But the Bureau will be able to do so soon. In a cooperative program, initiated by the Electronic Technology Division and carried out by this and two other NBS Divisions (Mechanics and Optical Physics), improvements in optical measurement understanding and procedures have been developed and artifacts in the micrometer range are expected to be available this year on a trial basis, with the fractional micrometer standards to follow.

The third point is that some practical needs are not being met because external influences on the measurement instrument, or sensory transducer are ignored, either inadvertently or because there is no available way to take them into consideration (usually for lack of information about the problem). The problem here is that calibrations are typically conducted under laboratory conditions that bear little resemblance to the real world environment of vibration, thermal transients, magnetic fields, and so on.

There are as many examples from semiconductor process control or in other types of manufacturing process control that could be used to demonstrate this point, but consider a totally different field this time: the case of some high-quality, high-priced pressure tranducers for flight-test instrumentation. Suspecting that these devices might be affected by thermal transients to which they are occasionally exposed in use, a simple, quick screening test to check for such sensitivity has been developed. This work was done in the Electronic Technology Division at the request of the DoD Range Commanders Council. Using this new method to test representative devices of several types including strain gauge and crystal-based transducers, it was found that apparent pressure shifts of 0.4 percent to 400 percent of full scale were observed solely as the result of thermal pulses with an energy density of 1.8 joules per square centimetre.

It has become abundantly clear that electronics is presenting a challenge to metrologists and is demonstrating an increasingly important need for advancements in the development and practice of practical, on-line measurements for a variety of social and economic reasons. Research is needed, to be sure; new methods and standards are required; and greater care is required in using the instruments that exist and have been calibrated in the traditional way.

NBS is responding to this challenge and need in its electronic technology program, where the goals are to develop cost-effective measurement technology for commerce (to specify electronic materials and devices), for industry (to control electronic device fabrication processes), and for government (to improve economy in procurement and application of electronic components and the systems which use them).

Reprinted from Dimensions, Journal of the National Bureau of Standards, Washington DC.

Forum

Conducted by Neville Williams

Have a pleasant evening if you can — and despite the music!

Strange as it may seem, I had to travel halfway around the world to generate the emotion to say something about this particular subject — about the prevailing and quite crazy use of excessive sound levels in modern entertainment situations. It's not only unnecessary but a definite physiological hazard, and a potential psychological hazard as well.

The use of very high sound levels is not new, of course, and it is not confined to any particular country. In Australia, as elsewhere, we've grown accustomed to the idea of "pop" concerts and discotheques, where sound levels are used which are not far short of the pain threshold, even for people without any apparent limitations on their hearing.

For people who do have hearing limitations — and they are fairly numerous — sound levels approaching or exceeding their pain threshold can lead to tension, headaches and nausea. Logically, such people should avoid high sound level situations, but they don't always have that simple option.

From a technical viewpoint, the design and production of high-power, high-quality audio equipment is a highly interesting subject and what is available today is a tribute to the skills of those involved. But, as in many other areas, the products of advanced technology are not necessarily in line with the best interests of the community.

If one protests, in a practical situation, that the audience could hear the proceedings perfectly well at a much lower sound level, one is likely to be regarded as old-fashioned and obviously not "with it". The amplification is not there simply to make the "music" clearly audible, one discovers; it's an essential ingredient in the total psychological impact. It's part of the process of "turning the audience on"!

To settle for merely adequate amplification would be akin to turning off the psychadelic display and relying on merely adequate lighting.

Dare I suggest that it might also expose the basic mediocrity of many performers?

So, we in the older generations tend to shake our respective heads, and to write off the loud music fad as something peculiar to youth; as something that they'll get over as they grow older. The chances are that they won't, but we'll say more about that presently!

Being in no way a pop fan, excesses have not affected me directly but the members of my family and other acquaintances are frequently the victims of what I believe is a spillover from the pop scene: the excessive sound level that is encountered nowadays in ordinary film theatres — not just for special films, but for literally every film!

Someone, as a treat, decides to take the children or the grandchildren to see a film that will interest them, only to come home again complaining of a headache from the roof-lifting sound level from a string of cartoons, and main-feature characters that are made to shout rather than talk.

Why?

Do projectionists and managers no longer slip occasionally into the auditorium to listen to the sound they are feeding to the patrons? What has happened to the old-fashioned "too-loud too-soft" button that we once relied on?

Do they imagine that every performance should follow the lead of the pop scene and belt the ears off theatre patrons?

Or are the projectionists and staff in modern multi-cinema complexes so isolated from the dramatic content of any one presentation that they merely roll the film and turn the sound up to some habitual setting, thereafter "letting 'er rip"?

Frankly, I'm not sure what the cause is. I'm complaining here about the end result, as it affects so many theatre patrons.

However, what directly inspired this present outburst was neither a pop concern nor a film presentation but an ethnic style concert of the type staged nightly wherever tourists tend to concentrate overseas.

A couple of such concerts during my recent jaunt were entirely successful as, for example, a night cruise on the lake at Lucerne in Switzerland — a balmy evening, a pleasant meal, and entertainment by Swiss nationals presenting their own style of music and dancing. It was a happy and spontaneous performance, with just enough amplification to make it all clearly audible above the incidental noise aboard the boat. Everyone went back to the hotel relaxed and happy.

Much the same remarks applied to a Tyrolean evening at the Adambrau restaurant at Innsbruck in Austria — a somewhat tougher battle between the presentation and a packed audience, but with amplification used sensibly and effectively, nevertheless.

What a contrast to an evening of Italian style music at Le Torre restaurant on the outskirts of Rome. It started off in promising fashion, with as many dishes and as much wine as the guests felt inclined to consume. Within a very short time, there was a hum of friendly conversation in a variety of languages.

But suddenly, around 9 pm, the atmosphere was shattered by the loudest noise I've been subjected to in many a long day. I've sat through orchestral concerts, organ recitals and many over-enthusiastic hi-fi demonstrations, and my ears are not easily overloaded. But I cannot recall any other occasion on which they have been so obviously "pumped" by sheer sound pressure. There were grimaces, startled looks and at least two people near me clapped their hands over their ears in a vain effort to shut out the din.

Sungravure staff artist Brian Evans: "Any resemblance between the cartoon characters and people living or dead is entirely intentional!"

If the intention was to silence the conversation, it certainly succeeded!

I stood it for about five minutes and then, with a couple of others, simply walked out and spent the next hour in the relative peace of the adjoining garden, where the goings-on were still plainly audible.

Around 10 o'clock the musicians abandoned the stage and the microphones and played their music from the floor, amongst the tables. Even without amplification, their accordions, fiddles and powerful Italian voices were very loud in the confined space, but at least they were natural.

Then why the grotesque degree of amplification for the initial performance? If it was supposed to enhance its appeal, I can only say that it had precisely the reverse effect on me. All the Mediterranean romance of the particular kind of music was sacrificed in the multi-decibel blare.

No less disturbing to me was the unquestioning acceptance of the entertainment by the rest of the audience. When prompted, some of them agreed later that the music had been too loud and that they had enjoyed the second part much better than the first. But they had simply carried on with the food and the wine, as if excessively loud sound was an integral and necessary part of the evening's entertainment.

I fear that this general attitude is widespread. So often, people in charge of sound systems seem to ignore the niceties of presentation and pour on the sound, with all the delicacy of filling a wineglass from a bucket! Worse, the audience accepts and puts up with it, as the way things are now done.

By coincidence, one of the people at my table who was conscious of the situation was the personnel officer for an Australian company which currently has on its staff about 80 apprentices and trainees, mainly involved in machining and fitting. Each year, every one of this staff group undergoes a hearing test, as a monitor for possible hearing damage occasioned by noise in the machine shop.

According to the personnel officer, 35 of the group are currently showing a definite and progressive hearing loss, but here's the crunch: every one of the number so affected regularly attends pop concerts and/or discos. Those that don't have retained normal hearing, despite the noise in their work environment.

Which brings me back to the point I made earlier: We may philosophise about young people and assume that they will get over their fad for very loud sound. They may tire of it, for sure, but it may well leave its mark in the way of impaired hearing for the rest of their lives because all the evidence I've come across suggests that the damage is irreversible.

These are days when we hear a lot about consumerism, environment and protection of the community. There are

The beginning of beautiful music.

DD30

Micro Seiki turntables.

A sophisticated range of direct drive and belt drive turntables.

Excellence of materials, meticulous workmanship, attention to minute engineering details . . .

A combination to produce impressive overall performance in sound reproduction.

Indeed, the beginning of beautiful music.

The Micro Seiki DD-30

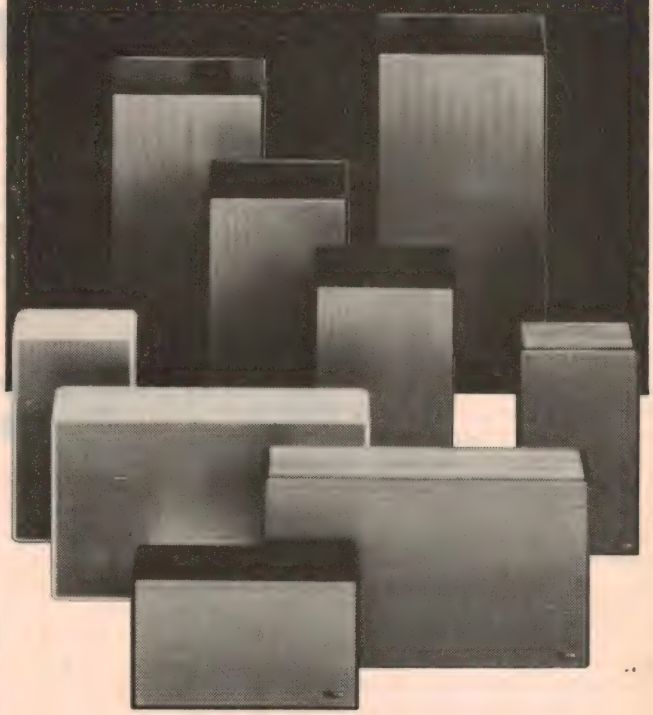
The new DD-30 features fully automatic, electronically controlled tone arm lift and return. The risk of mechanical failure is, thus, eliminated.

The unique floating suspension system of the DD-30 ensures crisp, clean sound. Direct drive from the DC servo motor results in wow and flutter of less than 0.03% WRMS.

The DD-30, one of the superb Micro Seiki range.

Select from belt driven models MB-10 and MB-15, direct drive models DD-20, DD-30 and DD-40. Ask for a demonstration soon.

The greatest range of sound from the smallest of enclosures.



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The Canton range of Hi-Fi loudspeakers includes seven units: The LE250 is the smallest at 30 x 17.5 x 13 cm with an RMS rating of 40 watts. The LE900 is the largest – 58.5 x 31.5 x 27 cm – with an RMS rating of 90 watts.

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PHOTIMPORT

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FORUM: Have a pleasant evening if you can . . .

limits on motor car exhaust emission and the noise patterns of aircraft; the intake of drugs and tobacco is discouraged; a variety of food and medicinal ingredients have been questioned because of their potential harmful effects and spirited arguments are raging about uranium and radioactive wastes.

Then what about giving some attention to sound level at various forms of entertainment, which must inevitably be making inroads into the hearing acuity of everyone exposed to it!.

I suspect that it may have psychological effects as well, at least to the extent of adding to the tensions and the fatigue that seems to be the lot of modern society.

How delicious and novel it is to get away into the stillness and peace of the countryside. Perhaps the contrast seems all the greater because we make it so — or allow it to be so — by creating and tolerating sound levels far in excess of necessity at other times.

Some may contend, of course, that high, loud sound levels have long been a feature of symphonic concerts and grand organ recitals, so why all the fuss now?

It's a fair question and I, for one, will never forget the enormous level that Marcell Dupre released from the Sydney Town Hall organ in a performance of "The Marseillaise". It was sheer sonic exhilaration, all the more so because it lasted only for a very short time. Had he played the whole concert in that fashion, it would have been tasteless and intolerable but, in fact, The Marseillaise was followed by items that ranged all the way down the decibel scale to the sounds of the most remote and delicate pipes. Sonically, a delicious sweet.

While I am on the audio bandwagon, I may as well take a sideswipe at the many people who are seemingly embarrassed by relative silence; who seem to assume that people are automatically made happier by being subjected to background music competing in level with whatever else is going on at the time.

The attitude is as firmly established in Australia as anywhere else but, in tripping around Europe, I was exposed to it more frequently than happens in my usual routine.

At home, my own inclination is to be quite selective, as distinct from others who allegedly work best and study best against a program from the local "top 40" radio station. If the radio, TV or record player is turned on, I tend to assume that the intention is to listen or to watch, and that talk should be limited to brief, pertinent comment. If the emphasis is to be on conversation, then let's turn off the distractions.

Back to public situations: one may typically be riding on a tour bus, watching the scenery, chatting quietly or even dozing if there is not too much to hold the attention. Suddenly, the driver or the tour guide gets worried that the passengers may be bored — and on goes a tape to make them happy again. A few may indeed respond, if it happens to be their kind of music and they want to listen rather than talk or doze — but the rest just put up with the intrusion, too timid or too polite to indicate disapproval.

Tour boats have their own sonic pattern. You are welcomed aboard to the sound of music played through spray-proof horn loudspeakers; music superficially appropriate to time and place and heard through the chatter of people trying to work out where they should go and where they should sit.

Later, the indifferent quality music gives way to an indifferent quality taped announcement about this or that; then click and the music takes over again until next time. Hopefully, somewhere on the boat, there will be a spot where the announcements can be heard but where the music is faint enough to be ignored!

And, finally, to the many restaurants, where the customer's ears are subjected to a mix of music, talking, walking and the rattle of utensils.

I have mixed memories of a sidewalk cafe in Florence which I visited on a couple of occasions, because it offered a most generous serve of the most delicious strawberries, cream and ice cream that I've ever tasted. Unfortunately, the gastronomic pleasure was compromised by the noise of patrons and passers-by, which was at such a level that one could converse only with difficulty. But the customers still got music with their strawberries — turned up sufficiently to compete with the already loud noise.

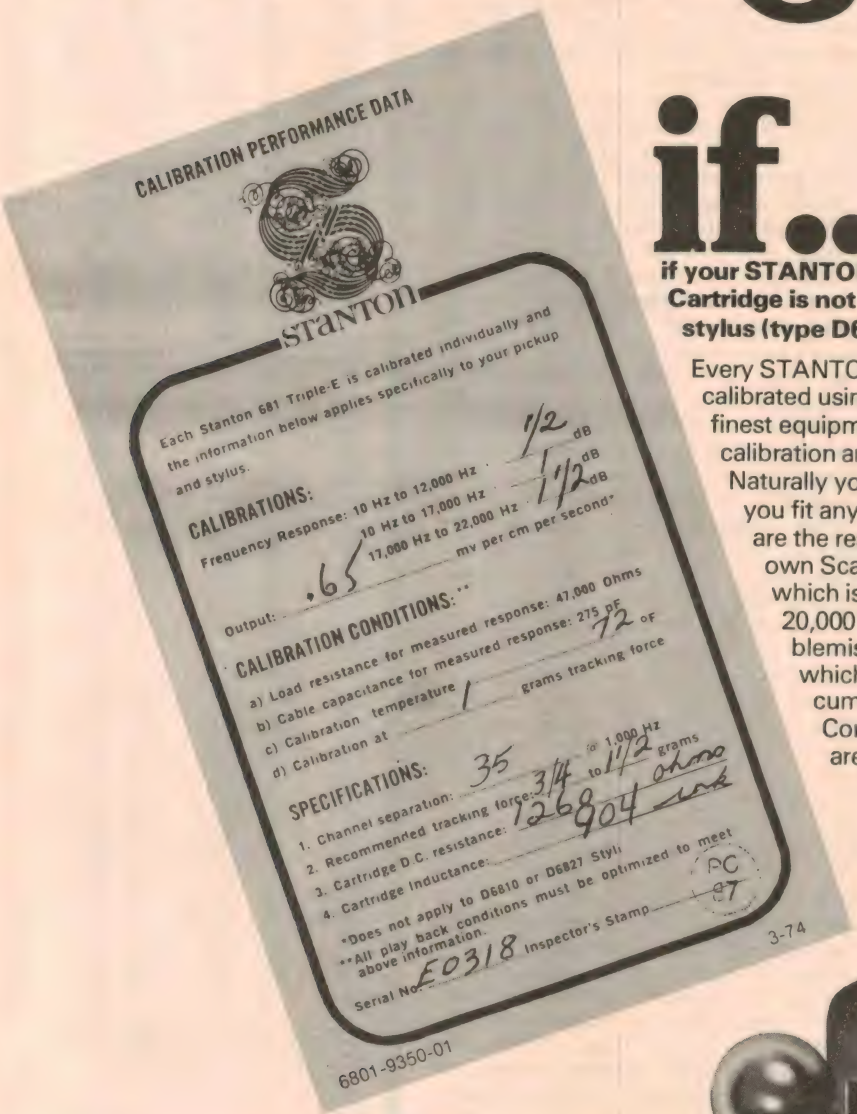
After all that carry-on, it may seem strange to say that I don't mind low-level background music of the deliberately bland type which one hears in elevators, waiting rooms and such like, although I prefer silence when involved in any kind of work requiring mental concentration.

The whole point of such music is that it is played only in relatively quiet areas, and at such level, and with such deliberately restricted dynamics that one can as readily ignore it as listen to it. Once it is turned up louder than that, or is required to combat high ambient noise, I'll join the ranks of protesters!

A horrible thought: I wonder if there really are ranks of protesters or am I the only one who has strong ideas about super-loud amplification and the make-people-happy-with-music cult?

I'd like to hear what others think about it.

This data is meaningless!



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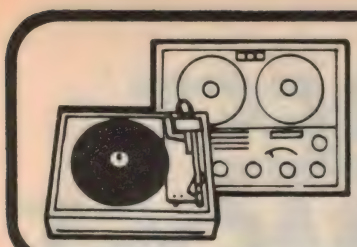

Hi Fi News

BASF TAPE FOR JAPANESE DECKS

With dealers' shelves already overstocked with cassette brands and types, why should a European-based manufacturer — BASF — decide to release a new line expressly designed for Japanese style recorders? Is it a sales gimmick or a move based on sound technical reasons?

by NEVILLE WILLIAMS

While BASF, like any other company, is not adverse to using any new angle which will help market its products, tape applications enginer Klaus Goetz explained to me the reason for his company's decision with considerable conviction and enthusiasm — this over a pleasant meal one evening in a restaurant beneath a ruined castle in the rural heart of West Germany.

I must say that, if one has to spend an evening talking technicalities, it would be difficult to nominate a more conducive environment!

From the very outset, Klaus Goetz emphasised, Philips of Eindhoven — the company which fathered the compact cassette — has been most keen to safeguard the cassette's basic compatibility as it found wider and wider application. It involved dimensions, traverse speed, track configuration, &c, all aimed at ensuring that any cassette from any source would be playable on any machine.

It was logical to assume that there would be cheap recorders and elaborate recorders, and that performance ceilings would rise with continuing research but Philips were determined to see that their cassette story would not be a replay of what was then happening to open reel tape, with the multiplicity of speeds, reel sizes and track configurations.

Because of their control of patents and their influence over the product, Philips were able to secure this basic compatibility, and this has been a powerful factor in the acceptance of the compact cassette in the domestic market. It has largely taken over from other forms of cassette, from cartridge and reel systems and remains unthreatened — so far — by the more recent Elcaset.

As part of the standardisation, Philips encouraged the use of magnetic tape having a particular value of coercivity — a parameter which indicates the amount of magnetic energy necessary to return the particles on the tape from a full, permanently magnetised state to zero magnetisation. In turn, it indicates the amount of high frequency magnetic bias necessary to swing the particles through a full magnetic hysteresis loop.

The first figure chosen is expressed on the accompanying graph as 26 kAmp/metre and, using this as a guide, equipment manufacturers could design their electronics and their recording heads to provide the optimum level of bias for (hopefully) all cassette tapes, irrespective of manufacturer.

In broad terms, HF bias is conventionally set at a level which approximates or slightly exceeds that which secures the highest level of recording on the tape at middle frequencies. If the bias is allowed to rise significantly above this level, there will be a progressive loss at the high frequency end of the audio spectrum, as recorded and played back.

If the bias amplitude is too low, the high frequency response will tend to be exaggerated relative to the middle frequencies, with a further tendency to increased distortion on the signal, overall.

As the manufacture of cassette tape was progressively refined, manufacturers came to accept as optimum a slightly lower figure of coercivity and bias — expressed as 24 kAmp/metre — and this is currently the basis of the European standards: DIN reference tape BASF TPLH super, batch T308S (high density iron oxide).

This represents predominantly European thinking but, as it happens, the cassette market nowadays is dominated

With this Australian-developed "Stereo Commander" unit, hifi enthusiasts can control the volume level from their sound system from the listening position. The Commander receiver, operating from the AC mains or a 12V supply, is positioned near the amplifier and is cut into the signal circuit by means of the sockets found at the rear of most modern systems. It controls the sound level in response to supersonic (40kHz) impulses from a hand-held transmitter. Normal range is about six metres but this can be increased with the aid of an extra microphone attached to the supersonic receiver. Price, complete with power supply and patch cords, is quoted as "less than $170". Although credited to Remote Control Systems Aust. Pty Ltd, inquiries should be directed to Insound Pty Ltd, cnr West and Hayberry Streets, Crows Nest, NSW.

OUR SECOND BEST IS BETTER THAN MOST OTHERS' FIRST BEST.

TDK's AD (Acoustic Dynamic) is one of the world's finest cassette tapes but not the best cassette tape made by TDK.

Our SA (Super Avilyn) has the edge but that's only if you're using the special bias/equalisation setting on your tapedeck.

However, if you're using the normal or standard setting, you'll have to settle for AD – second best.

Chances are you won't find anything better or with more consistent sound quality for decks with normal tape selector settings (or no selector switch at all). In other words, even if you don't own extravagant equipment, with AD you can still hear extravagant sound reproduction.

You see, because of AD's superior dynamic range at the critical high end, you'll hear any music that features exciting "highs", with amazing brilliance and clarity you won't get from any other tape.

But there is something else you should hear before you try TDK's AD. The price.

Unlike other so-called "super premium" cassettes, AD's price is down-to-earth (that should make AD sound even better).

There's just no comparison between ours and what others consider to be their best. So try the second best cassette we've ever made – AD.

Available in: C45
C60
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TDK AD
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by Japanese not European manufacturers — and they apparently have their own ideas about coercivity and bias levels!

For one reason or another, they have released tape after tape with a coercivity figure well above the European "24" standard and therefore requiring, theoretically, some increase in the level of high frequency bias. At the same time, there has been a tendency to edge up the bias level in Japanese recorders and both factors have operated to the disadvantage of their European competitors.

Thus the operator of a European standard machine may decide to try a highly promoted Japanese tape, without realising that it will be underbiased on his recorder. He is much less likely to notice a subtle increase in distortion than he is an added brightness due to a rising treble response. And, for many users, "brighter" has to mean "better", so the European tape suffers by comparison.

Conversely, the user of a recorder having a high bias may try a European or other tape with DIN standard (lower) coercivity. The tape will be over-biased, leading to a loss of treble response, and the conclusion that the tape is of inherently poorer quality.

Having become progressively more aware of the problem, BASF decided that they had no choice but to add to their range a tape more in keeping with current "average" Japanese (and/or Asian) practice. But, as Klaus Goetz explained to me, that is where their problems began. What was the Asian average?

There followed a lengthy research exercise, involving the purchase of sample cassettes from around the world markets in an attempt to secure representative tapes being sold by competitive companies. These were tested, compared and averaged to reveal a considerable spread in the measured figures of coercivity. Some tapes were only modestly above the European standard but others were way above it and well on the way to the standard for chromium dioxide tape.

The resulting distribution curve and a parallel study of Japanese recorders suggested that the mean lay in the region of 28 kAmp/metre and this is the figure which BASF chose as a desirable one for its new "Japanese compatible" tape cassettes.

A press release just to hand from BASF United Kingdom Ltd says that the new tape uses cobalt treated iron oxide particles and requires ideally an increase in the HF bias setting by between 1.5 and 2dB above the European DIN standard.

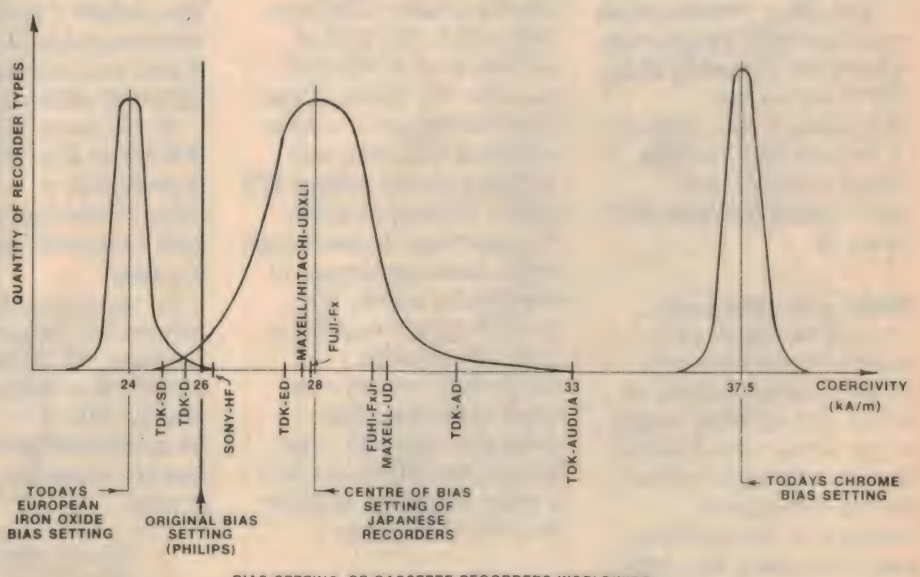
It also makes the point that a likely penalty of increasing the coercivity of a tape is a rise in the noise level. BASF claim that they have been able to keep the noise level of their higher coercivity tape to the same figure as for their normal LH Super: 50dB (DIN original) or 58dB (IEC) and a signal-noise ratio of 53.5 (DIN original) or 61.5dB (IEC) — both figures based on mono track technique without Dolby. BASF claim that these figures are not bettered by any other iron oxide formulation currently available. Super LHI also shows a 1dB improvement in the high frequency area compared with LH super.

Its new tape, BASF "ferro super LHI", may not be optimum for each and every Japanese cassette deck — any more than a given rival tape — but BASF's Klaus Goetz is convinced that it is spot in the middle of the coercivity distribution curve, as measured.

Advance samples of the tape are being made available currently for assessment by key consumers but it is not likely to be available for general release in Australia until the first quarter of 1978, on present indications.

NEW CASSETTE DECK FROM TOSHIBA-EMI

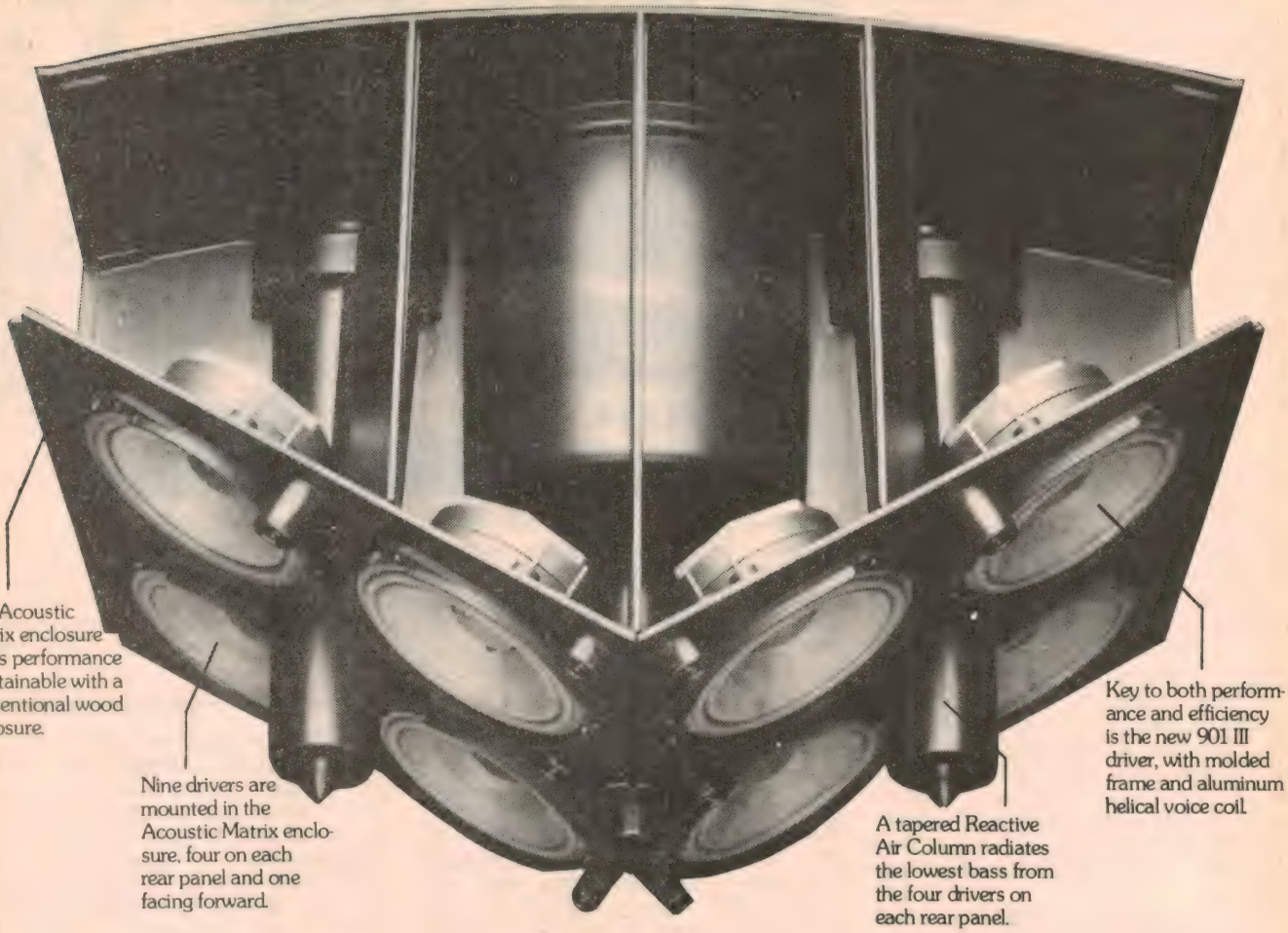
Designed to integrate with their SB series amplifiers, SA receivers and ST tuners, Toshiba-EMI's new PC-3060 front loading cassette deck has many attractive features. Specifications are excellent and it has provision for Dolby recording and for normal tapes, chromium dioxide and ferro-chromium. The transport controls provide all the usual facilities but can provide, as well, automatic replay, review and cueing. For further information: Toshiba-EMI (Australia) Pty Ltd, 16 Mars Road, Lane Cove, NSW 2066.



BIAS SETTING OF CASSETTE RECORDERS WORLDWIDE

Copied from data made available to "Electronics Australia" by BASF engineers in Germany, this diagram shows the divergence and spread of Japanese cassette tapes, in terms of coercivity, relative to the European DIN standard and practice. BASF's new ferro super LHI tape sits right in the centre of the Japanese curve. Incidentally, the unit kA/m replaces the older term Oersteds.

A speaker unlike any other



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In 1968, Bose introduced an unconventional loudspeaker system: the legendary Bose 901. Now, we are introducing a new speaker of revolutionary concept, design materials, and performance: the Bose 901 Series III.

What you will hear.
You will be struck by a sense of immediacy and presence, spaciousness of sound, and accurate stereo image almost anywhere in the room. Equally startling are the realism and accuracy of the timbre of each instrument, the clarity and dynamic range of the deepest bass notes, and the precise definition of individual instruments.

Efficiency
Most dramatic, however, is the remarkable efficiency with which this level of performance is achieved: the new 901 Series III can produce the same volume of sound with a 15 watt amplifier as the original 901 with a 50 watt amplifier. This dramatic breakthrough in the basic economics of high-fidelity makes it possible to put together a high performance component system at a lower price than was previously possible, even though the 901 Series III is a more expensive speaker than its predecessor.

Technology
Spectacular performance and efficiency are the results of proven Bose design concepts and technological innovations that include the unique, injection-molded Acoustic Matrix enclosure and a new, ultra-high efficiency driver.

At the same time, the 901 Series III is (as is the original 901), a Direct/Reflecting speaker with a separate electronic equalizer.

To appreciate the spectacular performance of the Bose 901 Series III, simply ask a Bose dealer to play the 901 III in comparison to any other speaker, regardless of size or price.

We submit that the 901 Series III provides more value in concepts, materials and performance than any other loudspeaker.

BOSE

PLEASE SEND ME THE 16 PAGE COLOUR BROCHURE ON THE BOSE 901 SERIES III

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PHONE: 642-3993 AUSTRALIAN DISTRIBUTORS

HIFI NEWS — continued

A new chromium dioxide cassette tape is also projected for 1978 and, when it appears, BASF customers will have the choice of four state-of-the-art tapes which should effectively cover present day needs:

- BASF ferro super LH (24 kAmp/m) optimised for European DIN standard recorders.
- BASF ferro super LHI, especially intended for Japanese recorders having higher than normal standard bias.
- BASF ferrochrome to suit recorders which have the appropriate bias and compensation provisions.
- BASF Chromdioxid super, conforming to the DIN standard for chromium dioxide tape.

YAMAHA-ROSE MUSIC PTY LTD was awarded one of only two Gold Stylus awards by the Federation of Australian Radio Broadcasters in recognition of the company's advertising campaign on Yamaha P.A. and mixer equipment. On air just before last Christmas, the adverts were written by Tony Fisher of Mullins, Clarke & Ralph (Vic.) Pty Ltd and spoken by Geoff Cox of 3DB.

HACO DISTRIBUTING AGENCIES, Australian distributors for "National", "Panasonic" and "Technics" products, were also the recipients of an advertising Gold award, this time from the manufacturer in Japan: the Matsushita Electric Industrial Company. The commercial was one which featured the editors of several Australian industry journals (see "Electronics Australia" for September 1976). It was devised by Tony Surtees of Quinlan Mitchell Malanot and Stott and narrated by TV personality Barrie Freedman.

ZEPHYR PRODUCTS of 70 Batesford Road, Chadstone, Victoria, announce that they have reached an agreement with Plessey Australia Ltd, which gives Zephyr sole distribution rights in Victoria for the recently announced range of Garrard turntables. Included is a high quality direct drive unit and various belt-drive models, variously featuring automatic, semi-automatic and repeat play, some with tangential tracking tone arms. They are presented in modular form, with teak bases and tinted acrylic dust covers.

In addition to the Garrard range, Zephyr will also distribute a new range of Plessey loudspeakers, manufactured in the first instance by Foster/Fostex. Exhibited earlier in the year by Plessey, the range includes domestic woofers, mid-range and tweeters, plus general purpose speakers and others designed expressly for musical instrument use.

Zephyr also distribute well known audio products such as Altec Lansing, JBL, KEF, QUAD, RCF, Radford and Auditec.

HARMAN AUSTRALIA PTY LTD announce that they have taken over the responsibility for the importation, distribution and service of Ortofon high quality and professional record playing components. Ortofon have previously been represented in Australia by Simon Gray Ltd and Rank Australia, but the new arrangement follows naturally from the acquisition of Ortofon by Harman International Industries Inc. Situated in Copenhagen, Ortofon Manufacturing A/S is well known for the manufacture of moving high quality coil cartridges, pickup arms and head amplifiers, as well as for cutting heads and amplifiers used for the production of disc recordings. "Ortofon" joins other well known names in Harman Australia's stable: JBL, Harman/Kardon, Chuo Electric (record players), Tokyo (CEC), Dynaco Inc., Bolivar Speaker Works, Tocord (cables), and White (instruments).

EMI (AUSTRALIA) LTD have advised their distributors that sales of 8-track cartridges have dropped to a level where it is no longer economical for the company to continue manufacture. They envisaged that current stocks would not last beyond October so that, by the time you read this, 8-track cartridges on the EMI (Australia) label will belong to history, except for a few odd ones remaining on dealers' shelves.

ROSE MUSIC PTY LTD of 17/33 Market Street, South Melbourne 3205, feel that they have a Yamaha turntable available to suit every hi-fi need — and wallet! Recently added to their range, the YP211 sells for a modest $245 but features slim styling, automatic controls, static balance arm, antiskating, cueing and gold-plated headshell contacts. It is covered by a 3-year parts and labour warranty.

The YP511, retailing for $319, uses an 8-pole D servomotor to drive a 1.6kg turntable. Wow and flutter are down to a miserly 0.04% (WRMS). Operation is simple.

VFS SOUND, specialising in top of the range equipment has opened on the 4th floor of 106 Goulburn Street, Sydney (entrance round the corner in Nithsdale Street). You can ring manager Vic Forstman on Sydney 61-2589.

AIWA (Eye-ee-wah is the way it sounds in Australia) received a bonus in the huge Consumer Electronics Show at Chicago when their AD-6800 cassette deck was selected by a panel of independent judges for display in the special Design and Engineering Exhibit — the only cassette deck so chosen. With advanced engineering and specifications, it employs double needle meters which react to both peak and V.U. functions, plus advance circuitry to set the bias for overall flat frequency response. Details of this deck, plus its companions AD-6550 and AD-6400, can be obtained from AIWA (Australia) Pty Ltd, 14 Gertrude Street, Arncliffe, NSW.

At last it's a reality! Electronics has created the

One Man Band

In the picture above, Roland Amplification Manager, Gerry Stoll, puts the new Roland Guitar Synthesizer through its paces. Almost all the equipment shown is involved in the performance and he really does sound like a complete combo!

by LEO SIMPSON

As I sit and type I am trying to establish in perspective a fabulous new musical instrument. Having just attended an overwhelming personal demonstration lasting several hours, the potential of the new instrument seems enormous. It greatly increases the scope of musicians, and could rewrite the rulebook for recording studios.

These days people have become used to the sight of keyboard-controlled synthesizers as part of pop groups or modern jazz combos. Often they are featured in conjunction with electronic organ or electric piano. At the same time, people have come to expect certain types of sound from synthesizers. Some would say it has become stereotyped. To a large extent, that would seem to be true.

At the same time, the role of the guitarist in these pop groups and combos has diminished in importance. But the status of the guitarist could once again become pre-eminent with the introduction of this new instrument from Roland.

At first sight, the Roland GS-500 does not look very different from any other deluxe solid-body guitar. Any other fine guitar in this context means a custom-made Gibson or Fender Stratocaster, which may cost up in the region of $1000.

In keeping with the presentation of other deluxe guitars, the Roland GS-500 has a highly polished mahogany body, a specially designed maple neck and an ebony fingerboard. But apart from having a few more switches and knobs than usual, the appearance is certainly not out of the ordinary.

In fact, the first demonstration unit was lost for a period and the local Roland people went through a trying time worrying about the fact that it was unique and "unfloggable". Finally, it was returned, in exchange for a reward.

Closer examination of the GS-500 reveals quite a few special features in addition to those found on normal gui-

tars. For use as a standard guitar, the GS-500 has a set of six "humbucking" pickups (each pickup has two coils which are connected so as to cancel hum). Associated with the pickups is a three-position equaliser switch which provides settings for "soft", "hard" or "acoustic" sound. The latter term refers to the sound quality of an "acoustic" guitar.

Also associated with the normal guitar pickups is the tone control and volume control which are grouped together with the equaliser switch.

All the other controls and switches on the GS-500 are associated with the synthesizer functions.

The synthesizer functions are not controlled by the humbucking pickups. Instead, set close to the bridge, there is another set of pickups which look very like ¼-inch tape heads. Apparently there is a magnet system underneath the strings (between the humbucking pickups and the fingerboard) which enables the "tape" heads to produce an output signal which is related to string vibration.

The tape heads have been placed close to the bridge so that each tape head produces output only from its designated string. This is important when the guitarist engages in "pitch bending" whereby the strings are pulled across the fingerboard to produce upward changes in pitch. If the heads were further away from the bridge the strings could be pulled across to adjacent heads, and this could upset the string identification which triggers various synthesizer functions.

Really, the heart of the system is not the guitar but the companion GR-500 synthesizer which, in addition to the overriding controls on the guitar, has a mass of controls of its own.

Basically the GR-500 has five independent sound producing sections. Each section has its own output which may be directed to any of three separate channels, plus a "Mix out" channel for connection to a single amplifier.

The mixing and selection of each or all of the five sound producing sections is controlled by the knobs and switches on the guitar itself.

As with each other section of the GR-500 synthesizer, the guitar section is threshold conscious and has a LED which lights to show that this particular section is presently operating. The idea behind the threshold for each section is that the guitarist can control the output of sounds from each of the five sections merely by plucking the strings more heavily or softly as the case may be.

The first control section on the GR-500 synthesizer is in fact the guitar output. This may be switched on or off by a three position switch on the guitar which provides for the following functions: Guitar only, Synthesizer only and Guitar plus synthesizer. The guitar control panel on the synthesizer features a single slider knob which is marked "equaliser". We assume this is a variable bandpass filter.

This impressive Roland guitar and accompanying synthesizer can drive a little or lot of equipment to produce some exciting and complex sounds. It vastly increases the potential capabilities of one musician.

The second section of the GR-500 is the "polyensemble". This comprises an envelope generator with separate controls for attack, decay, sustain and four voicing mixers (woodwinds, reeds, brass and strings). These voices, which are all pitch-related to the notes struck by the guitar, can simulate voilins, brass ensembles, harpsichord and even the human voice. It is quite uncanny to see the guitarist plucking strings and yet producing bowed violin notes! Even more mind-bending is the sight of the guitarist applying string vibrato to these bowed violin notes (which were actually produced by plucking the guitar strings) in exactly the same way as a violinist would.

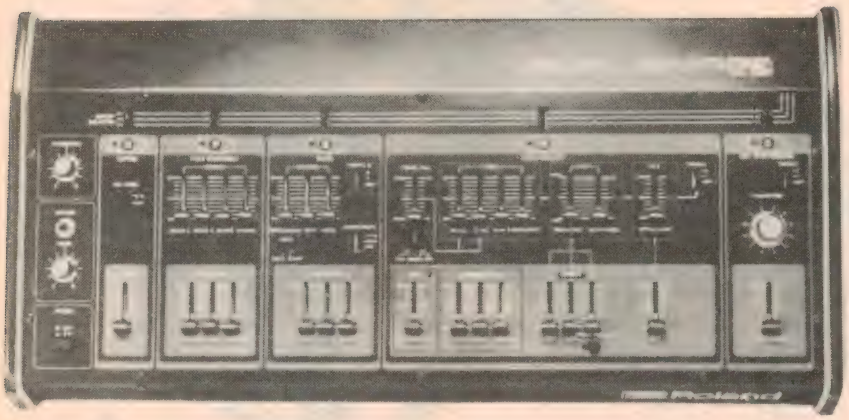
At the same time, he can alternate between guitar and violin (or any other or all of the "voices" in the poly-ensemble section) merely by varing the intensity of his string plucking. Or, he can use the appropriate switch to provide the same mode jumping.

Lest the system seem too, too clever we should remark that all the synthesizer functions are monophonic in operation, as are most synthesizers. But there is more to the system. Far more!

Now consider the Bass section on the GR-500. This also has an envelope generator with controls for attack, decay and sustain. There are also three voicing mixers which enable simulation of string bass, tuba and other bass instruments. It also has a "Last Note Priority" facility and a string selector.

The string selector allows the bass accompaniment to be applied to all

Roland Guitar Synthesizer



strings: 1/2/3/4/5/6; 3 strings: 4/5/6 or 2 strings: 5/6. In the last case, for example, the guitarist can play a melody on all strings but the GR-500 bass accompaniment only chimes in for the lowest two strings. Again, the bass accompaniment produced by the GR-500 can have string vibrato applied to it in the same way as the previous section.

"Last note priority" refers to a system designed to take out the last picked note by suppressing the succeeding note in down-stroke picking. For example, when string 5 is picked after string 6, the note produced by string 6 is suppressed at the exact moment string 5 is picked. String 5 will in turn be suppressed when another string is picked. The last note priority system applies only to those strings designated by the string selector.

Fourth section of the GR-500 is the Solo Melody section. This is very much like a conventional synthesizer with envelope controls, voltage controlled filter, voicing mixer, pulse width modulation and a low frequency oscillator (for scanning the voltage controlled filter).

As with the Bass section, the Solo-Melody section has the last note priority system, a 2-position touch sensitive switch which allows intonation and a LED which shows that the section is actually operating.

The last section provides controls and outputs for an external synthesizer which may also be hooked via a tape echo system.

In total, the GS-500 and accompanying GR-500 synthesizer can drive up to five separate amplifiers and loudspeaker systems, when working at its maximum potential. Where less equipment is available, the guitar/synthesizer can drive just one amplifier and loudspeaker system.

If all this seems like an immensely complicated system, I can assure the reader that he has gained but a modest impression. When actually demonstrated it is overwhelming, both in terms of the amount of equipment involved and the sheer volume and variety of sound produced.

One wonders how the musician using the system would feel. Is he still a soloist? Maybe not. He may think of himself as a duo, trio, quartet or quintet. And as far as the musical effect is concerned he would be right. Maybe when musicians begin to master the complications and potential of this new instrument system there will be a lot of incredible new music, and more than a few schizophrenic musos!

Alternatively, the musician might develop a persecution complex (or he may even go paranoid). After all, every time he strikes a note, all these other guys seem to chime in unison. What will the Musicians Union of Australia say about it all?

There are some interesting implications for recording studios too. Presently, many pop groups use multiple track recording and dubbing to add in as many instruments and effects as they can obtain. This can be a laborious and time consuming process which can result in a mediocre final result, as far as the sound quality is concerned.

Using the Roland guitar/synthesizer, one, two or three musicians can provide a wealth of musical effects, all at the one sitting and possibly only having to use a 4-track recorder rather than a costly eight or sixteen track machine.

And in a market where the sky can be the limit as far as equipment is concerned, the projected price of the Roland GS/GR-500 seems quite reasonable. It is expected to be under $2000, with the exact figure depending on whether import duty will be applicable.

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THE ADC CARTRIDGE CAUSES NO PERCEIVABLE WEAR OVER THE LIFE OF A RECORD.

A series of tests conducted by a leading independent audio-testing laboratory prove it.*

The tests show that the ADC XLM-MKII cartridge causes no perceivable wear until after 60 plays. Industry sources estimate the "life of a record" (the average number of times a record is played) to be 40 to 50 plays.

Other cartridge manufacturers may talk about less record wear, but ADC has proven *no wear over the average life of a record.*

The reason for this is our unique patented design. It's patent #3294405.

We call it the "induced magnet" cartridge.

Most cartridges are designed so that a heavy magnet is part of the moving system.

The ADC XLM-MKII is different, because our engineers found a way to detach the magnet and reposition it above the stylus, so the stylus applies less pressure against the groove.

Less pressure means less wear.

The fact is, of all the leading brands, ADC cartridges have the lowest mass moving system you can buy. That means better sound and superior performance.

The XLM frequency response is exceptionally flat, from 15Hz to 24KHz ±1.5dB. And for the ultimate in stereo reproduction, it has a minimum of 28dB of channel separation.

Think about it. In the long run you'll probably spend more on your record collection than you will on your whole stereo system. So it makes sense to buy a cartridge with proof that it makes your records sound better and helps them to live longer. The ADC low mass cartridge.

Unbelievable.

THE ADC LOW MASS CARTRIDGE.

IT HELPS YOUR RECORDS LIVE LONGER.

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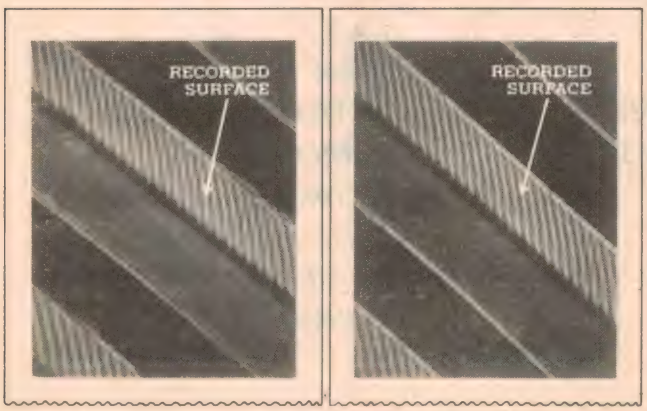
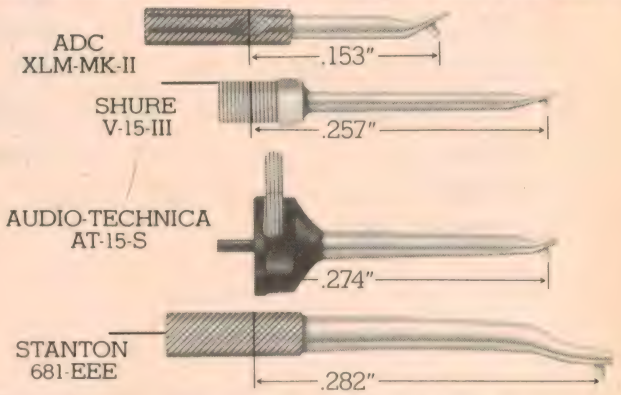
THE PROOF:



This is a photomicrograph of a 20kHz record groove that has never been played before.

This is a photomicrograph of a similar 20kHz record groove played 75 times with an ADC XLM-MKII cartridge. As you can see there is no difference.

THE DIFFERENCE:



The way to get the most accurate reproduction of sound is to lower the total effective mass of the moving parts of the stylus. And that's exactly what our engineers did. In fact, of all the leading brands, ADC cartridges have the lowest mass moving system you can buy.

INDUCED MAGNET

MAGNET

* CBS Technology Center Project 1108: Record Wear Test Program. Performed for Audio Dynamics Corporation. December 1976.

COMPTON BSR137

Mitsubishi DA-F10 FM-AM tuner

Mitsubishi is a new name to the Australian high fidelity market. This long-established Japenese manufacturer is introducing a range of premium equipment typified by the tuner reviewed here. The Mitsubishi DA-F10 is an AM/FM-stereo tuner with excellent specifications, and is one of the few tuners on the market with a selectivity switch.

Housed in a fairly bulky case, the Mitsubishi DA-F10 has styling which looks very "technical" without being overcrowded with knobs and gee-gaws. The front panel is finished in brushed aluminium while the dial, meters, handles and top cover have a semi-gloss charcoal finish. Case dimensions are 425 x 170 x 280mm (W x H x D), including handles and real projections. Mass is 7.5kg. Clearance of about 195mm is required at the rear of the tuner to allow the AM rod antenna to be fully swung out if necessary for good reception.

Controls are fairly simple and are well labelled so that their purpose is self evident. The Selector knob has four positions: AM, FM auto, FM mono and FM mono/muting off. In the auto and mono modes of FM reception the muting threshold is just under 10 microvolts. Signals smaller than this figure can be received by switching the selector to "FM mono/muting off".

The Mitsubishi DA-F10 is one of few tuners which can boast a "selectivity" switch. In the narrow selectivity setting the tuner has improved suppression of adjacent channel interference, which is presently not a problem in Australia. However, the selectivity switch is still a most worthwhile feature because it is associated with improved figures for distortion and separation between channels (when set to the wide selectivity setting).

A circular dial within a rectangular frame gives an unusual touch to the styling. The FM portion of the dial is provided with 200kHz calibrations, while the AM calibrations are almost non-existent. Does that indicate Mitsubishi's comparative attitudes to FM and AM? The answer would seem to be yes.

Like most other manufacturers of FM/AM tuners, Mitsubishi have quite vague specifications for the AM section and neglect to mention the frequency response at all. Needless to say, the AM performance is good enough to recognise a tune, but not enough to get excited about.

On the rear panel there are three pairs of RCA sockets which provide fixed and variable stereo outputs, plus output signals for a Multipath display on an oscilloscope. Terminals are provided for FM antenna connection via 75 ohm coax cable or 300 ohm ribbon, AM long-wire antenna and ground. Our sample was fitted with two-core flex and and two-pin plug.

We hope that units sold to the public are fitted with the correct three-core flex and three-pin mains plug.

Removing the top cover reveals an uncluttered internal layout with all components readily accessible. Access to the PC boards is easily gained by removing the underside panel. Semiconductor complement is five integrated circuits, 38 transistors and 19 diodes.

Much of the tuner's performance is displayed in the two graphs accompanying this review. The Quieting characteristics are very similar to those obtained with many other premium quality units. We were not able to confirm Mitsubishi's figures for ultimate signal-to-noise ratio, which were 70dB in stereo and 75dB in mono. Our results were 68dB in mono and 64.5dB in stereo.

Limiting was complete at 3 microvolts input. Note that while the measured ultimate signal-to-noise ratios are not the highest we have measured, the Quieting slope, ie, the rate at which the tuner approaches its ultimate S/N ratio, was comparable to the best tuners we have tested.

Response of the signal strength meter is also shown of the graph of the Quieting characteristics. From this it can be seen that the meter circuitry appears to be saturated for signals of 200uV and beyond. While this is not a very progressive response it could be argued that the meter tells you all you need to know. After all, for signals of 200uV and above the tuner has reached its ultimate signal to noise ratio.

The other graph displays the frequency response and excellent separation between channels when operated in the wide selectivity mode. In fact,

If you can see a difference, imagine what you'll hear.

Magnified, you can see record vinyl wearing away.

With same magnification, record vinyl shows no wear.

You're looking at the solution to one of the oldest problems in audio—how to protect records from wear, while at the same time preserving full fidelity.

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Independent tests show that discs treated with Sound Guard preservative played 100 times display the same full amplitude at all frequencies and the same absence of surface noise and harmonic distortion as "mint condition" discs played once.

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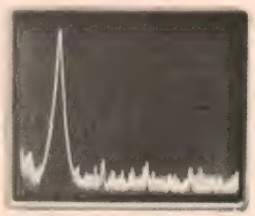
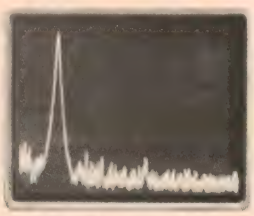
Len Feldman in Radio Electronics reports "At last! The long awaited record-care product has arrived. It preserves frequency response while reducing distortion and surface noise." It's effective and safe for all discs, from precious old 78's to the newest LP's.

Sound Guard preservative, in a kit complete with a non-aerosol pump sprayer and velvet buffing pad, is available in audio and record outlets.



Test record played first time.

After 100 plays without Sound Guard.



Identical test record after 100 plays with Sound Guard.

Sound Guard keeps your good sounds sounding good.

*Sound Guard is Ball Corporation's trademark for its record preservative. Copyright © Ball Corporation, 1976.

Sound Guard is distributed throughout Australia by

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LER 196

this is only the second tuner we have tested to date which has turned in separation figures in excess of 50dB. Even in the narrow selectivity mode the separation figures are quite adequate, at 30dB or more over most of the audio range.

Frequency response was quoted as 30Hz to 15kHz ±1dB. We measured it as 20Hz to 15kHz within +0, —2dB in both mono and stereo.

19kHz suppression was 65dB down while 38kHz suppression was greater than 70dB. Readers may wonder how we managed to produce these two figures when the ultimate signal-to-noise ratio in stereo was in fact higher than 65dB (ie. worse). The answer is quite simple. A large component of the residual noise of the DA-F10 is hum. We measured the 19kHz level by first passing the residual noise through a high-pass filter to remove the hum and other low frequency components.

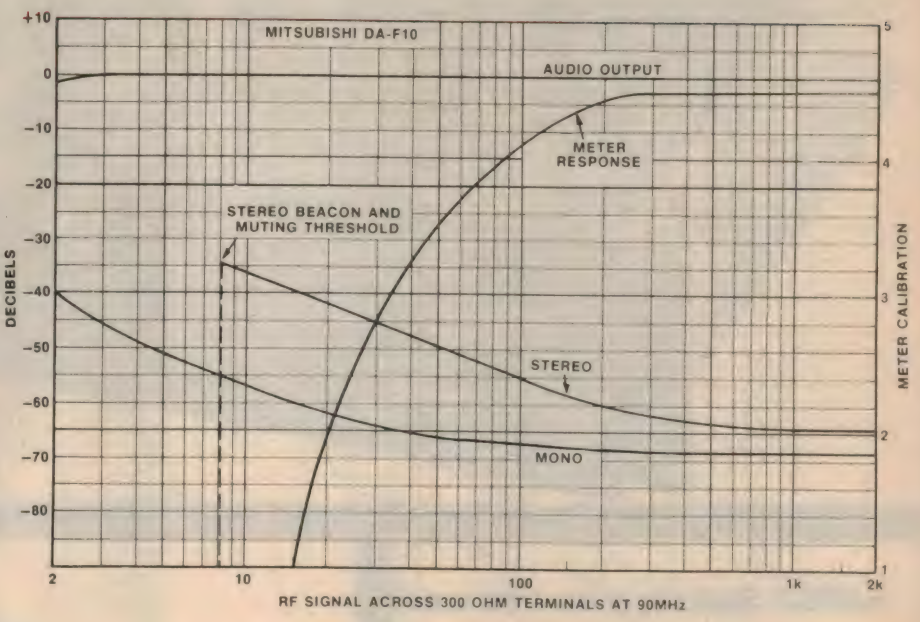
As might be expected from the fine calibrations of the FM portion of the dial, calibration accuracy is very good and would appear to be within better than 25kHz over the whole tuning range.

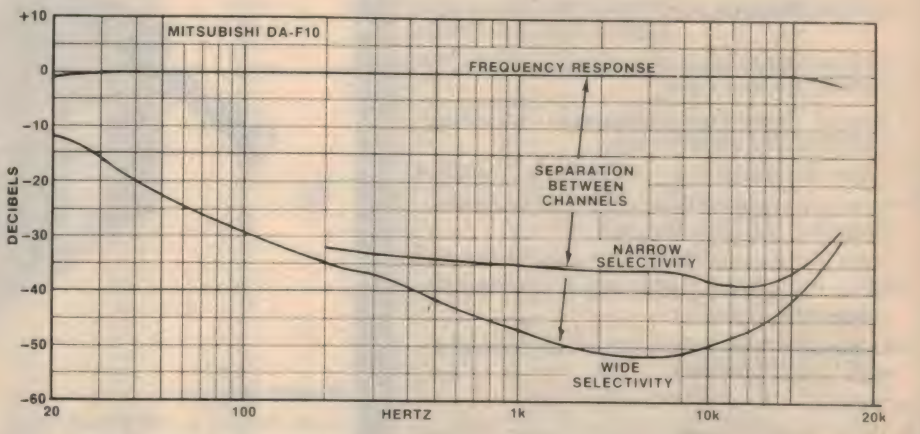
Harmonic distortion is quoted for both wide and narrow selectivity settings, but the modulating frequency and modulation level are not specified. For the narrow selectivity mode, we obtained mono distortion readings of 0.25% at 100Hz, 0.22% at 1kHz and 0.4% at 6kHz; while in stereo the respective readings were 1%, 0.8% and 0.4%. Switching to wide selectivity gives a slight improvement to the mono distortion figures and a very worthwhile improvement to the stereo figures. In mono we measured 0.23% at 100Hz, 0.18% at 1kHz and 0.29% at 6kHz. In stereo mode, the respective figures were 0.5% at 100Hz, 0.4% at 1kHz and 0.3% at 6kHz. These figures are not as good as those quoted by Mitsubishi, but are still quite creditable.

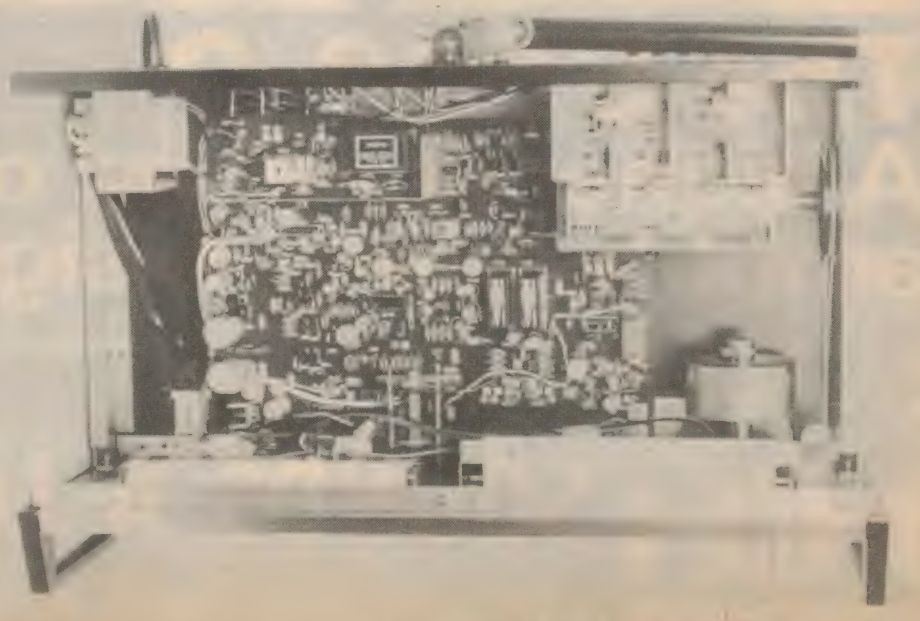
We listened to the DA-F10 process program material from FM stations and from our own "off-air" music signals via our FM generator and found the sound reproduction very good. The tuner mutes and unmutes without "pops" or other transients and tuning is not very critical — provided the "lock" and "stereo" indicators are alight you are virtually assured of excellent sound.

Overall, the Mitsubishi DA-F10 is an impressive new contender in the hifi market and one which must be considered by those desiring a unit capable of premium performance. Recommended retail price is $347.00.

Further information can be obtained from hifi retailers or from the Australian distributors AWA-Thorn Sales Pty Ltd, 348 Victoria Road, Rydalmere, NSW 2116. (L.D.S.)



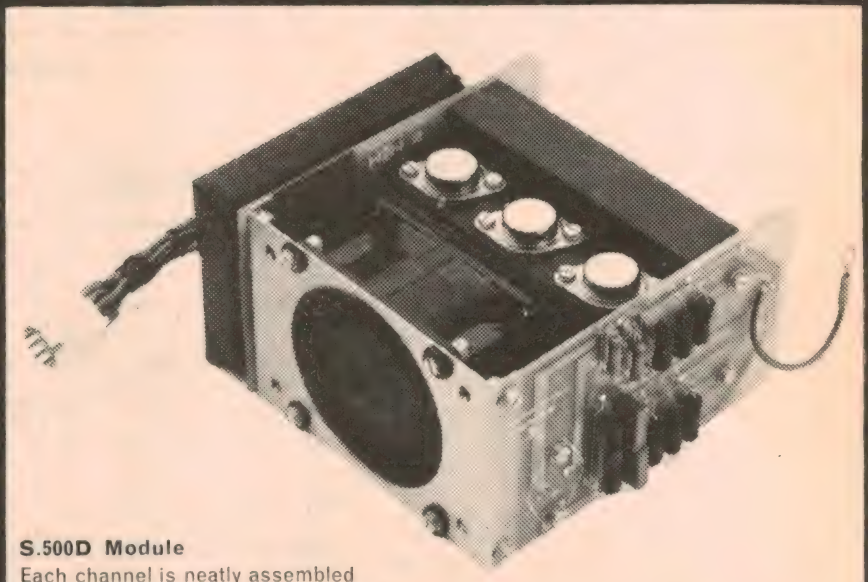




Meet the New Leader....

S.500D Specification Features

* Power output 340W R.M.S. into 4 ohms
  500W R.M.S. into 2.5 ohms
* Bridged Mono output 900W R.M.S. into 5 ohms
  640W R.M.S. into 8 ohms
* Intermodulation Distortion Less than 0.02% from 20Hz to 20KHz F1 60Hz.
* Integral "Force Cooled Dissipators" for reliable operation into adverse loads.
* Power Bandwidth +0, −1dB from D.C. to 20KHz.
* Very low Transient Intermodulation Distortion. Restricted rise time, fast slew rate.
* Input sensitivity 0.75V for 300W into 4 ohms.
* Noise 105dB Below 180W into 8 ohms 10Hz to 20KHz. Unweighted.
* Elaborate system protection against short and open circuit operation
* Small size 3½" x 19" Rack mounting.
* 1KVA Toroidal power supply providing 55 joules of energy.



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Standard PM-403W stereo amplifier

Bargains are rare in the hifi market. Whether or not you regard this Standard PM-403W amplifier as high fidelity is up to you, but there is no denying that it is a bargain. It has all the usual control facilities and a rating of 12 watts per channel into 8-ohm loads.

Measuring 340 x 100 x 200mm (WxHxD) and with mass 3.6kg, the Standard PM-403W has a neat extruded aluminium front panel and a wraparound timber case with simulated wood veneer. It is supplied fitted with three-core mains flex and three-pin mains plug.

Five knobs and four push-buttons provide the control facilities. The three-position selector gives a choice of three signal sources: phono, tuner and auxiliary, while the "tape monitor" push-button allows selection of a cassette or tape recorder.

The loudspeaker selector pushbutton gives a choice of two pairs of loudspeakers, "main" and "remote". Plugging in a pair of headphones switches off the "main" loudspeakers if they happen to be selected.

With the exception of the headphone socket, all signal inputs and outputs are DIN sockets. Four 2-pin DIN sockets provide the loudspeaker connections while the inputs are made via 5-pin sockets.

A slider switch on the rear panel converts the phono input to suit a ceramic cartridge instead of a magnetic type. Since this merely inserts a large series resistor into the input circuit of each channel, it is hardly likely to provide accurate equalisation for a ceramic cartridge. However, this should not worry many prospective buyers, as magnetic cartridges are now available at very reasonable prices and provide a far superior result.

Removing the four rubber feet allows the chassis to be withdrawn from the timber case. Most of the circuitry is accommodated on one PC board, with the plastic power transistors clamped to a common heatsink bracket. Access to the copper side of the PCB is via a large cutout in the chassis. Most of the wiring is neat and tidy, although we would prefer to see the mains switch and its connections a little less exposed.

With a semiconductor complement of 18 transistors and 10 diodes the circuit of the amplifier can be described as simple. The power amplifiers use six transistors each, with quasi-complementary output stages and capacitive coupling to the loudspeakers. The output capacitor is incorporated in the feedback network so that the damping factor at low frequencies is high.

The RIAA preamplifiers each use two transistors in a direct-coupled configuration while the tone control circuit uses a single transistor as a common-emitter amplifier to make up the losses in the passive RC networks.

In fact, the overall circuit configuration of the Standard PM-403W is very similar to some of the most popular high fidelity amplifiers of a few years ago, which in terms of 1977 dollars (September 1977, that is) cost a whole lot more.

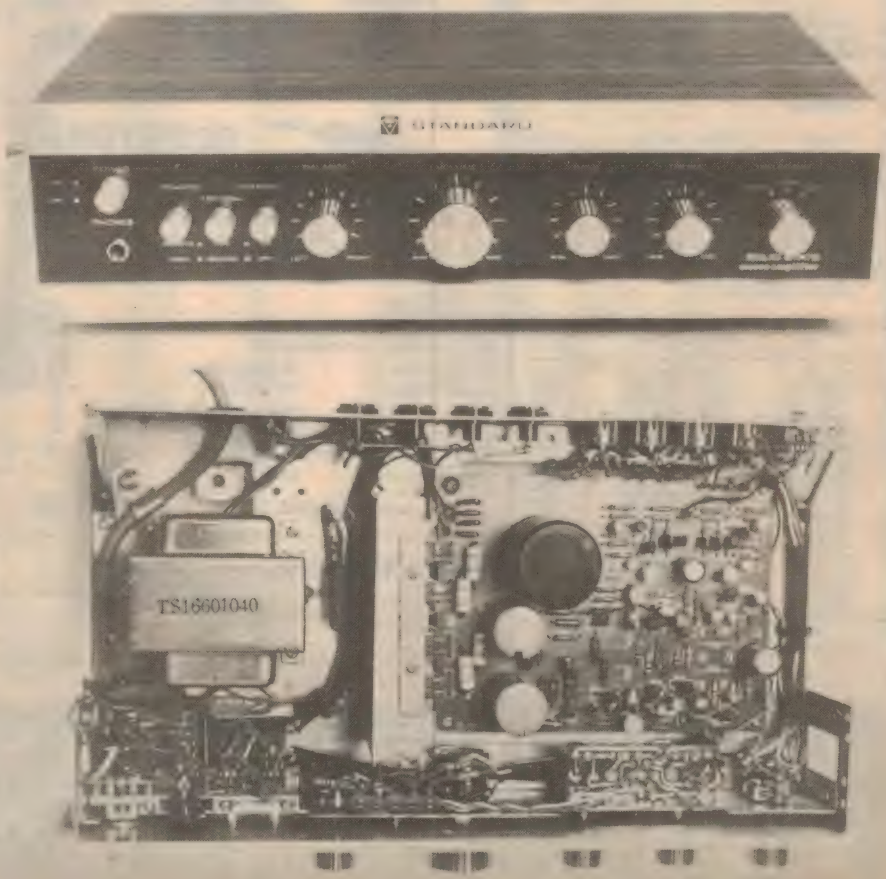
Our measurements confirmed the specifications of the PM-403W in most respects. We measured power at 10 watts per channel into 8-ohm loads, with one or both channels driven. Harmonic distortion at this power level was 0.7% at 10kHz, 0.4% at 1kHz and 0.35% at 100Hz. Under the same conditions, separation between channels was 45dB at 10kHz and better than 60dB at 1kHz and 100Hz.

Into 4-ohm load, we measured 14.5 watts into a single channel and 12 watts with both channels driven. Harmonic distortion at full power at 1kHz into 4 ohm-loads was about 1.5%.

Phono sensitivity was 2.8mV for full power at 1kHz and the overload threshold ranged from 80mV at low volume control settings to 40mV at high settings (at 1kHz). Phono signal to noise ratio was 64dB with respect to full power and an input signal of 10mV at 1kHz, with a typical cartridge connected. Translated, that means the amplifier is reasonably quiet.

Other parameters tested satisfactorily. Listening tests confirmed that the performance was good and that the power was adequate in typical rooms with loudspeakers of reasonable efficiency.

In summary, our impressions of this neat and compact amplifier were very favourable. And at the bargain price of $59, how can you go wrong? Rush out and get on the queue at Classic Radio, 245 Parramatta Road, Haberfield, NSW 2045. (L.D.S.)



T.T.L.

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SN7401N	.44	SN7474N	.90
SN7402N	.44	SN7475N	1.10
SN7403N	.44	SN7476N	1.10
SN7404N	.44	SN7483AN	1.65
SN7405N	.44	SN7486N	.75
SN7407N	.75	SN7490AN	.90
SN7408N	.44	SN7492AN	.85
SN7410N	.44	SN7493AN	.85
SN7412N	.44	SN7495AN	1.50
SN7413N	.90	SN7496N	1.90
SN7420N	.44	SN74107N	.75
SN7430N	.44	SN74121N	.79
SN7432N	.65	SN74122N	.95
SN7437N	.75	SN74123N	1.10
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SN7447AN	1.65	SN74145N	1.95
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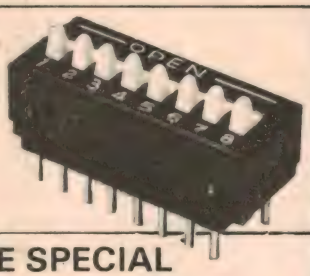

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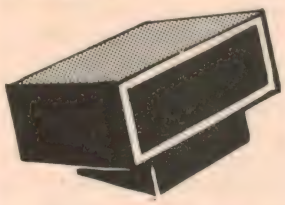

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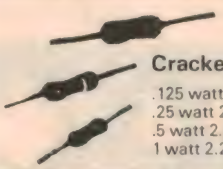

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Similar to ORP12

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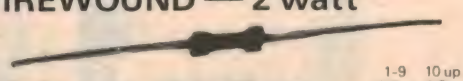

.47, .56, 1, 1.2, 1.6, 2, 4.7 ohm — 1-9 **45c** 10 up **40c**

Capacitor Corner

Disc Ceramic — 50 volt

	1-9	10 up
2m2 3.3 4.7 6.8 8.2 10 15 22 33 47 68 82 100 150 220 330 470 1K 2K2 3K3 4K7 10K 22K 47K pfd	11c	8c
100K 25V	16c	14c

Polyester and Foil — 250 volt

	1-9	10 up
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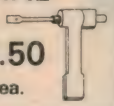

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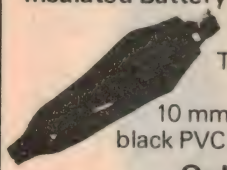

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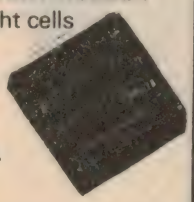

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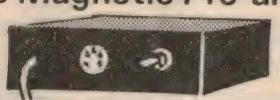

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Simple mixer for pick-up and microphone

The little mixer unit described in this article will enable you to mix together a high level source such as the ouput from a record player or a tape recorder, and a low level source such as a microphone. It can be very handy for generating home movie soundtracks and can also be used as a microphone preamplifier for use with hi-fi amplifiers lacking such facilities.

by DAVID EDWARDS

The incentive for this project arose out of a need to mix a microphone with a high level source, to generate the soundtrack for a home movie. But it soon became obvious that a simple mixer capable of meeting these requirements could also be used in a variety of other situations.

For instance, the unit could be used to mix a microphone signal with a high level audio signal, making it possible to "sing along" with records or tapes. Other uses which come to mind include adding an identification (verbally) to computer programs or RTTY messages stored on cassettes, and in adding personal comments to your own recordings.

As you can see from the photographs, the mixer is constructed in a small low-cost metal case. The one used for the prototype measures 150 x 100 x 60mm, and has an aluminium chassis with a steel lid. It was kindly supplied by Dick Smith Electronics Pty Ltd. We elected to power the unit with a battery, both on the grounds of cost and to minimise any possible hum problems.

Readers are referred to the accompanying table for a list of the pertinent specifications of the prototype.

Turning now to the circuit diagram, we can discuss the operation of the circuit. The microphone preamplifier is implemented with a two stage DC coupled pair. DC feedback from the emitter of the second transistor is used to bias the input transistor, while the gain is set by the ratio of the 100k feedback resistor and the effective AC impedance in the emitter of the input transistor.

The collector load of the input transistor is decoupled by a 22uF bypass capacitor, while a 1k/47pF low-pass filter is used at the input to eliminate possible RF interference.

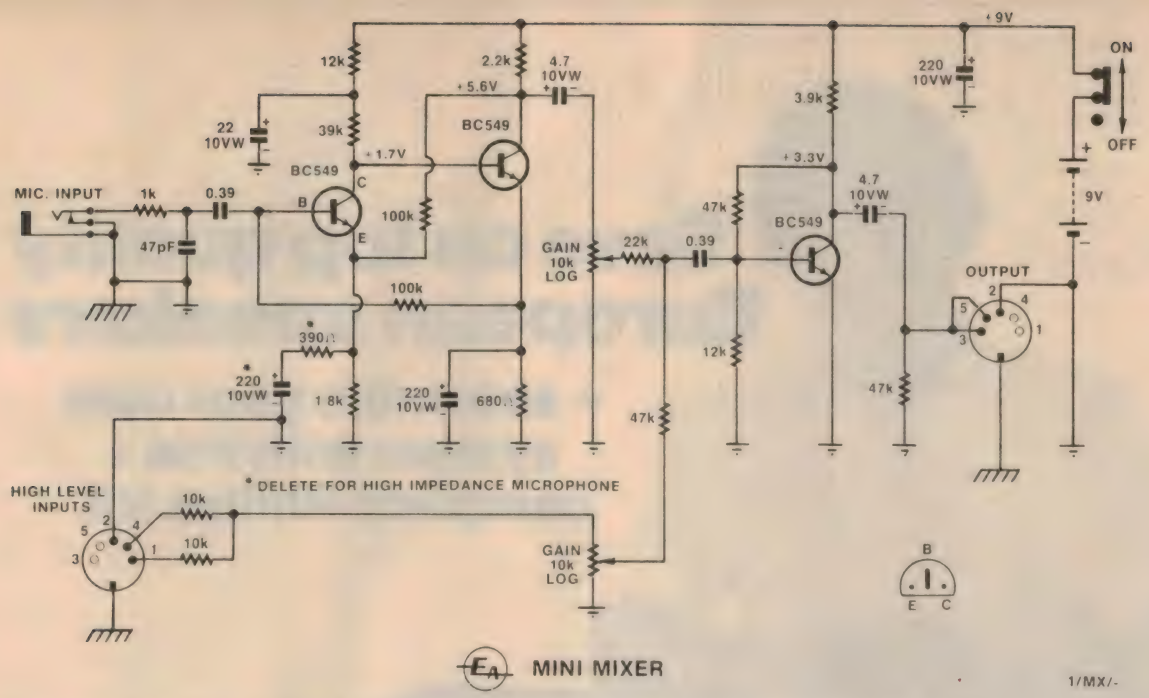
For use with high impedance microphones, the marked components are deleted. This gives a nominal gain of 56. For use with low impedance microphones, higher gain is required, and this is achieved by reducing the AC feedback with the marked components. This gives a nominal gain of 250.

The transistors we have specified have the required gain and noise performance to achieve very close to the nominal gains. Only electrically equivalent types such as BC109s, should be used as substitutes.

A shorting type of input connector has been used for the microphone connector, in order to minimise the input noise when no microphone is connected. We used one of the 3.5mm dia. jack sockets, as this suits the majority of currently available microphones supplied with movie cameras, projectors and cassette recorders.

The microphone preamplifier is intended to work with dynamic microphones of either the low or high impedance type, as were commonly supplied with the cheaper cassette recorders before the introduction of electret microphones. It will also work well with separate electret microphones having an output impedance of around 2k ohms.

No amplification is provided for the high level inputs. Provision is made for



Our circuit is suitable for both high impedance and low impedance microphones.

stereo inputs, which are mixed together passively by 10k mixing resistors. The high level inputs are connected to the circuit via a 5 pin DIN socket, wired so that the mixer unit will be electrically equivalent to a tape recorder, so that it may be connected to an amplifier via a standard DIN cord.

Two 10k logarithmic potentiometers are used to control the levels of the two inputs. The outputs from these controls are mixed in a simple virtual earth mixer. The gain of each channel can be varied by changing the input resistor. We do not recommend that the 22k resistor used for the microphone channel be changed, although in some cases it may be advantageous to lower the 47k high level resistor to 22k in order to increase the gain in this channel.

For the prototype, we provided a separate DIN socket for the output, as this suited the purposes we had in mind. However, for use with hi-fi amplifiers the output could be connected to pins 3 and 5 of the input socket, so that only one cord would be required to connect to the amplifier.

Connection to the amplifier would then be via the tape recorder sockets, and the mixer unit would be switched into circuit using the tape monitor switch.

A miniature slide switch was used for the power switch, with a 220uF electrolytic capacitor in parallel with the battery to ensure a low supply impedance. The DC voltages noted on the circuit were measured with a high impedance voltmeter, with a supply voltage of 9V. They should be taken as representative values only.

A battery voltage of 7V was taken as the design point for the DC bias calculations, so that reasonable performance would be obtained over a wide range of battery voltages. Testing of the prototype confirmed that performance was essentially constant from 6 to 9V.

Construction of the unit should be very simple, as all components are contained on a single printed circuit board, coded 77mx11. This measures 96 x 87mm, and is supported in the case by the connections to the pots and the on/off switch.

Commence construction by fitting the input and output connectors, and the controls to the box. Use the PCB as a guide to position the latter components, remembering to leave a clearance at the top of the box for the connectors. Fit the controls to the box, and then solder short lengths of tinned copper wire to their connecting lugs, and put the assembly aside for the moment.

Now fit all the components to the PCB. Ensure that the polarity conscious components, such as capacitors and transistors are fitted correctly. Use PCB pins to make the connections to the board for the battery lead and the input

SPECIFICATIONS

POWER REQUIREMENTS
9V at 3mA (Eveready No. 216 or similar battery)
Estimated battery life: in excess of 150 hours

OUTPUT CHARACTERISTICS
Nominal output voltage: 100mV RMS
Maximum output voltage: 2V RMS
Frequency response: 20Hz to 200kHz at -1dB points
Nominal ouput load: 10k ohms or greater

LOW IMPEDANCE MICROPHONE INPUT
Input impedance: 100k ohms
Sensitivity: 0.2mV for nominal output
Input overload: 6mV at 1kHz
Signal to noise ratio: -36dB below nominal output and with S/C input
Distortion: masked by residual noise but less than 0.4% at 1kHz

ALTERNATIVE HIGH IMPEDANCE MICROPHONE INPUT
Input impedance: 100k ohms
Sensitivity: 1mV for nominal output
Input overload: 40mV at 1kHz
Signal to noise ratio: -40dB below nominal output and with S/C input
Distortion: masked by residual noise but less than 0.1% at 1kHz

HIGH LEVEL INPUT
Input impedance: 15k ohms
Sensitivity: 250mV for rated output
Input overload: 5V at 1kHz
Signal to noise ratio: -45dB below nominal output and with S/C input
Distortion: less than 0.04% at 1kHz

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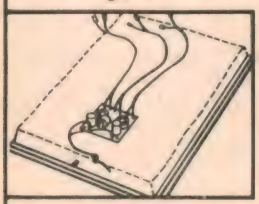
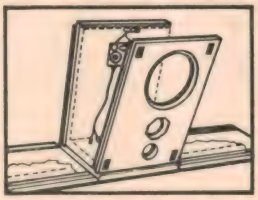
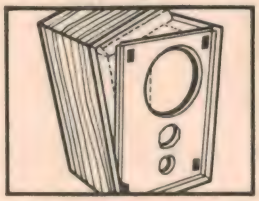


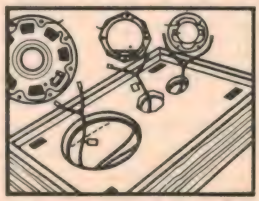
1 *Screw the crossover networks to the baffle boards.*



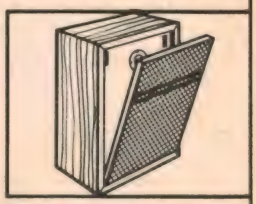
2 *Apply glue to the case and fit baffle boards in grooves.*



3 *Wrap sides of case around baffle board.*



4 *Insert speakers in holes and screw into position.*



5 *Clip fascia panel in place.*

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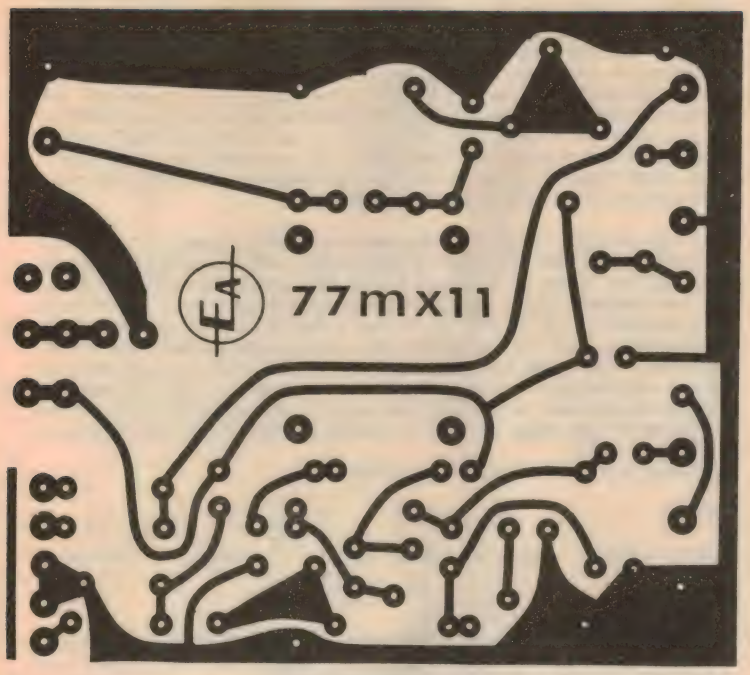
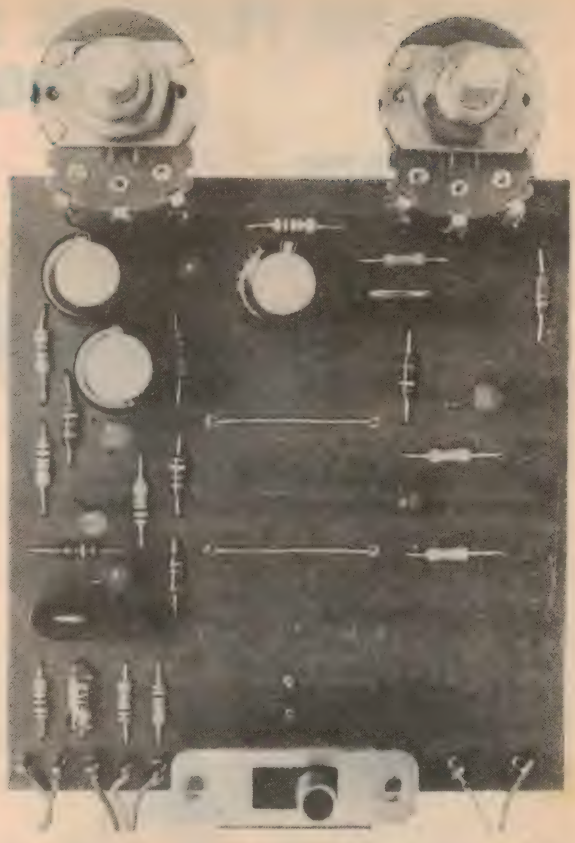
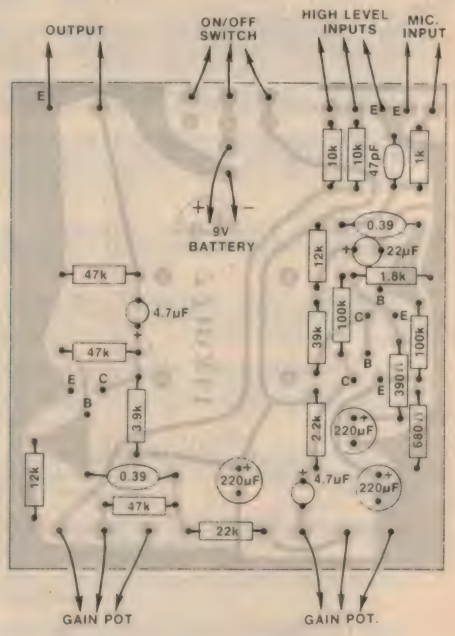
Mixer for pick-up and microphone



Actual size reproduction of the PC pattern.



Top: the assembled board. Below: the component overlay.



PARTS LIST

3 BC549 or equivalent low noise/high gain NPN silicon transistors
1 printed circuit board, coded 77mx11, 96 x 87mm
1 metal case, 150 x 100 x 60mm, see text
2 10k logarithmic potentiometers
2 knobs to suit
1 miniature slide switch
2 5-pin 180 degree DIN sockets
1 miniature earphone socket
1 216 type 9V battery and clip to suit

CAPACITORS
3 220uF 10VW electrolytics
1 22uF 10VW electrolytic
2 4.7uF 10VW electrolytics
2 0.39uF polyester
1 47pF ceramic or polystyrene

RESISTORS (all ¼W)
2 100k, 3 47k, 1 39k, 1 22k, 2 12k, 2 10k, 1 3.9k, 1 2.2k, 1 1.8k, 1 1k, 1 680 ohm, 1 390 ohm

MISCELLANEOUS
Solder, tinned copper wire, hookup wire, machine screws and nuts, cardboard or insulating tape.

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.

and output connections.

The battery is mounted on the copper side of the board, but remember to insulate the tracks underneath it with a piece of cardboard or insulating tape. Fix the battery to the board using string or tinned copper wire, using the four holes provided. At this stage, do not connect the battery clip to the battery.

Ordinary hookup wire can be used for the input and output connectors, provided the leads are kept short, and the input and output leads separated. This is facilitated by the pattern on the board. Once all these leads have been fitted, offer the PCB up to the controls, feeding the tinned copper wire through the appropriate holes.

After checking that the board is positioned correctly, solder all the connections, and clip off the excess wire lengths. If at a later stage it is required to obtain access to the top of the board, this can be achieved by removing the controls from the top of the case.

Testing of the unit consists of trying it out, giving all controls, inputs and switches a quick operational test. If the unit fails to operate correctly, check the DC voltages marked on the circuit diagram, and try to isolate the faulty section. Then check for incorrectly soldered joints, wrong components, or faulty components.

In conclusion, the only point to watch is that you remember to turn the unit off when it is not in use, in order to prolong the battery life. Provided you keep this in mind, you should be able to look forward to many hours of happy mixing.

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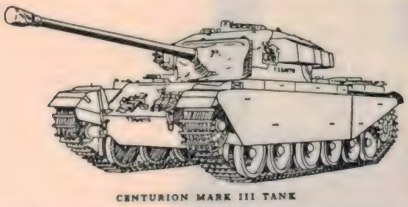

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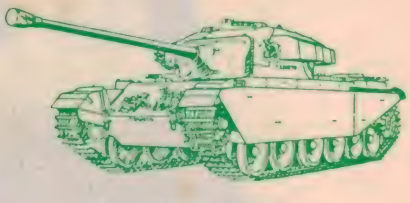

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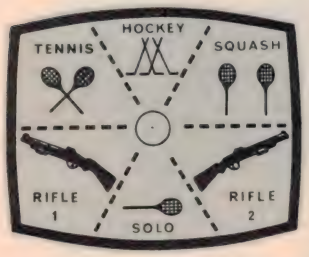

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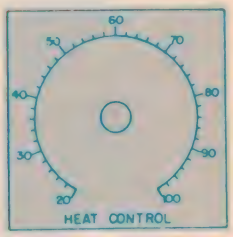

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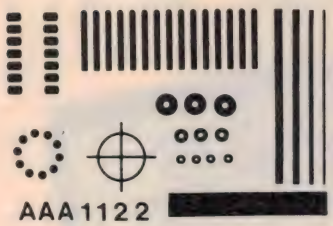

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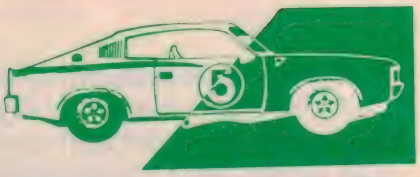
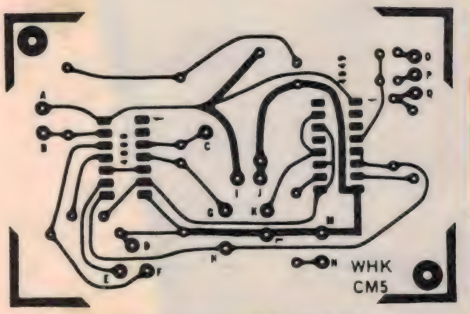


POSITIVE & NEGATIVE ON GREEN PLASTIC LABEL



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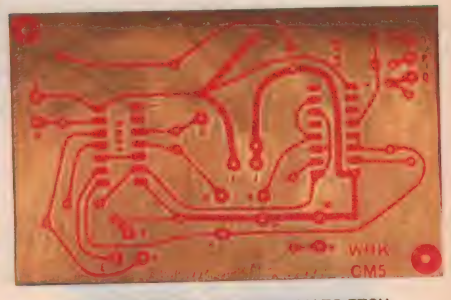

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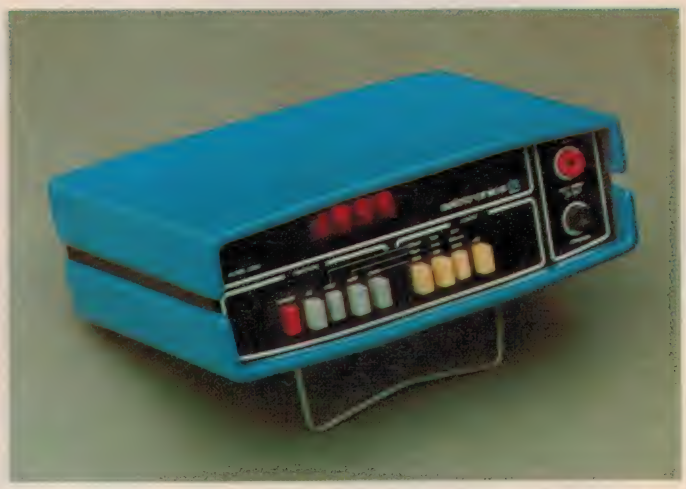

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SSB/AM

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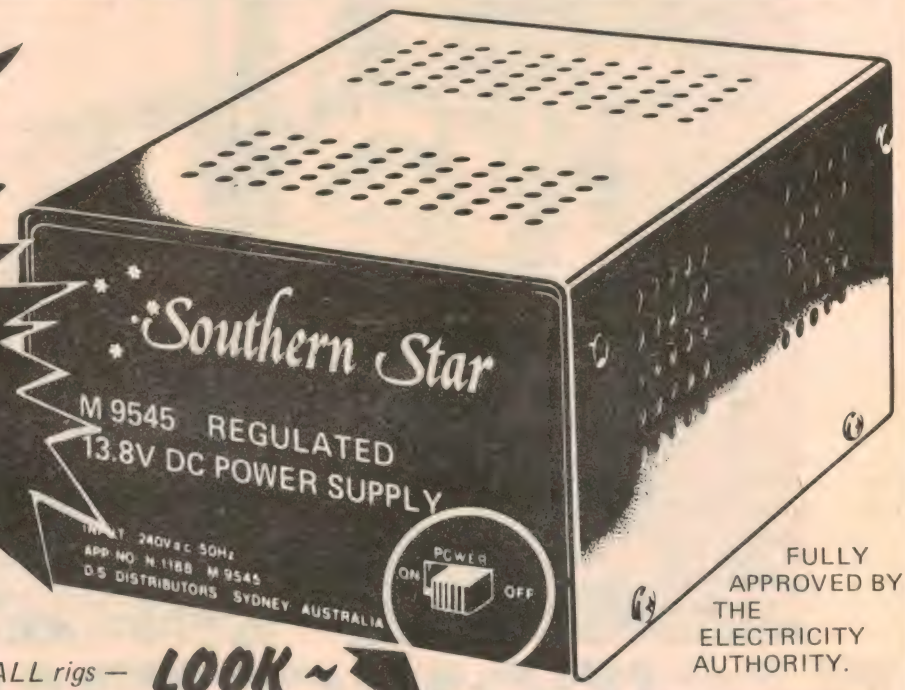
HUGE 4AMP PEAK



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The Australian CB SCENE

AN AM CB TRANSCEIVER FROM SHARP AUSTRALIA

Compact, neat and modern in design, the CB-800A is the Sharp Corporation's answer for the CBer who wants an AM transceiver which will fit neatly into the family car.

Most obvious feature of the CB-800A is the uncalibrated channel selector knob and the LED readout in the window alongside, which indicates clearly the channel to which the transceiver is tuned. Rotating the knob brings the numbers up, in turn, with two points of note: on the emergency frequency (USA channel 9) the digit flashes to warn the user that there is something special about that setting; secondly, when the public address function is invoked, any digit being displayed in the window is replaced by the letters "PA".

Also visible through the window is a signal and RF power meter but, unlike the LED readout, it is really too small to be of much use to a mobile operator.

There is a volume control knob, with a supplementary "power off" function, and a squelch control.

An ANL switch invokes the automatic noise limiter function, while a "Delta" switch shifts the receiver tuning from channel centre frequency to plus or minus 1kHz. The microphone plugs into the front panel, while antenna, power, PA and extension speaker connections are at the rear.

The receiver is a dual conversion superhet, employing 3 crystals and a phase locked loop to ensure frequency stability, with intermediate frequencies at 11.275MHz and 455 kHz. Selectivity is quoted as 6dB down at ±3kHz, and 50dB down at ±10kHz. Power output is rated at 3W and input sensitivity 0.7uV for 10dB signal/noise ratio, with 30% modulation at 1000Hz.

The transmitter also uses a phase locked loop for frequency control and includes modulation limiter circuitry to ensure maximum "talk power". Input is set nominally for 5W, harmonic suppression is 50dB, and output is coupled to antenna at the usual 50 ohms impedance.

On test, the receiver sensitivity was never in doubt, with the receiver's own limits far below the natural noise and interference ambient on any CB channel. The ANL switch tended merely to soften the noise spikes under these congested conditions, and the Delta switch had only a minor effect. Both controls would probably come into their own, however, for out-of-town use.

The squelch operated smoothly and effectively with the possible difference that it was less abrupt than usual, tending to act more as a severe mute for signals just below the threshold.

If we had any criticism at all, it would be that the channel change, while mechanically very smooth, did produce some noise output from the speaker; a minor point, however.

Tested into a dummy load, the transmitter produced very close to 4W RF output with about 13.6V applied and monitoring under these conditions indicated, full, clean modulation. If the unit appeals, its performance in practice should be right up to expectations for an AM CB transceiver.

Recommended retail price for the CB-800A is $149.95. For further details: Sharp Corporation of Australia Pty Ltd, 64-80 Seville St, Fairfield, NSW or P.O. Box 233, Fairfield 2165; tel: (02) 728 9111. (W.N.W.)

Remember the "EVERSHARP" pencil?

There was a time when the trade name "Eversharp" was so familiar that people used it to refer to any propelling pencil. What few people know is that it dates back to 1915 and is the word from which the 65-year-old Sharp Corporation presently derives its name.

Since then, the Sharp Corporation has moved heavily into electronics and can claim a long list of industry "firsts":

1953 — Mass production of Japanese TV.
1962 — Mass production of microwave ovens.
1963 — Mass produced solar batteries.
1964 — Solid-state desk top calculator.
1965 — 19in. colour TV receiver.
1971 — "Compet" calculator passes the million mark; first IC colour TV marketed; Sharp Australia established.
1974 — Mini calculator with memory.
1976 — Ultra-thin (7mm) calculator.

The story does not end there and the company is still "looking sharp", with a super-slim (5mm) calculator, and no protruding keys, liquid crystal display and an audible input check.

And there's a line of cassette radios bristling with all modern facilities.

CB OPERATING CONVENTIONS

FREQUENCIES: Australian v. USA 23-channel

Aust. Ch.	Freq. (MHz)	USA Ch.
—	26.965	1
—	26.975	2
—	26.985	3
—	27.005	4
1	27.015	5
2	27.025	6
3	27.035	7
4	27.055	8
5	27.065	9
—	27.075	10
6	27.085	11
7	27.095	—
8	27.105	12

Aust Ch.	Freq. (MHz)	USA Ch.
9	27.115	13
10	27.125	14
11	27.135	15
12	27.155	16
13	27.165	17
14	27.175	18
15	27.185	19
16	27.195	—
17	27.205	20
—	27.215	21
18	27.225	22
—	27.255	23

FREQUENCIES: USA, Extension to 40 Channel

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
24	27.235	30	27.305	36	27.365
25	27.245	31	27.315	37	27.375
26	27.265	32	27.325	38	27.385
27	27.275	33	27.335	39	27.395
28	27.285	34	27.345	40	27.405
29	27.295	35	27.355		

THE "10" SIGNAL CODE

CODE MEANING

10-1 Receiving you poorly.
10-2 Receiving you well.
10-3 Channel in use.
10-4 Message received.
10-5 Relay message.
10-6 Busy. Can't talk now.
10-7 Out of service. Going off air.
10-8 Back in service after shut-down.
10-9 Repeat message.
10-10 Was 10-6. Now on call.
10-11 Talking too rapidly.
10-12 Visitors are present.
10-13 Advise weather, road conditions.
10-14 Time by the clock.
10-17 Important business.
10-18 Anything for us?
10-19 Return to base.
10-20 My location is:
10-21 Contact me by phone.
10-22 Make personal contact with:
10-23 Stand by.
10-24 Assignment completed.
10-25 Contact another station by radio.
10-26 Disregard last transmission.
10-27 I am moving to channel:
10-28 Proper station identification.
10-29 Time is up for contact.
10-30 Violates regulations.
10-31 No longer in violation of regs.
10-32 I will advise re signal readability.
10-33 Emergency traffic at this station.
10-34 In trouble; need help.
10-35 Matter of urgency but cannot discuss it by radio.
10-36 Transmission or event is scheduled for:
10-37 Send tow truck.
10-38 Injuries; send ambulance.
10-39 Your message was delivered.
10-41 Moved to another channel.
10-42 Traffic accident at:
10-43 Traffic congestion at:
10-44 I have a message for:
10-45 Stations on this channel please identify.
10-50 Break.
10-62 Unable to copy; use phone.
10-63 Net directed to:
10-64 Net clear.
10-70 Fire at . . .
10-84 My telephone number is . . .
10-85 My address is . . .
10-89 Radio repairman needed at
10-92 Your xmitter needs adjusting.
10-94 Please give me a long count.
10-100 Rest stop.

PHONETIC ALPHABET

A—ALFA
B—BRAVO
C—CHARLIE
D—DELTA
E—ECHO
F—FOXTROT
G—GOLF
H—HOTEL
I—INDIA
J—JULIETT
K—KILO
L—LIMA
M—MIKE
N—NOVEMBER
O—OSCAR
P—PAPA
Q—QUEBEC
R—ROMEO
S—SIERRA
T—TANGO
U—UNIFORM
V—VICTOR
W—WHISKEY
X—X-RAY
Y—YANKEE
Z—ZULU

R-S SIGNAL REPORTS

READABILITY

1—Unreadable.
2—Barely readable, occasional words distinguishable.
3—Readable with difficulty.
4—Readable with little difficulty.
5—Perfectly readable.

SIGNAL STRENGTH

1—Faint signals barely perceptible.
2—Very weak signals.
3—Weak signals.
4—Fair signals.
5—Fairly good signals.
6—Good signals.
7—Moderately strong signals.
8—Strong signals.
9—Extremely strong signals.

THE "Q" CODE

The Q code was originally devised as a means of speeding up communication between operators using Morse Code. A Q-code letter group may serve as a statement or it may be posed as a question — in Morse Code simply by adding to it a question mark.

Q-code letter groups have tended to carry over to speech communication as jargon, needlessly displacing plain language words.

Listed below are the Q-code letter groups most likely to crop up as jargon in speech transmissions.

QRM Your transmission is being interfered with. Is my transmission . . .?
QRN My reception is marred by static. Is your reception being marred . . .?
QRO Please increase your power (if possible). Shall I increase power?
QRP Please reduce your power (if possible). Shall I reduce power?
QRT Stop sending (or transmitting). Shall I stop sending or transmitting?
QRV I am ready. Are you ready?
QRX I will call you again at . . . (time) on . . . (freq). Will you call me again . . .?
QRZ You are being called by . . . on . . . (freq). Who is calling me?
QSL I will acknowledge receipt (by card, etc). Will you acknowledge receipt?
QSO I can communicate with . . . Can you communicate with . . .?
QSP I will relay to . . . Will you relay to?
QSY I will change frequency to . . . Can you change frequency to . . .?
QTH My location (more commonly home station address) is . . . What is yours . . .?
QRT The time is . . . What is the correct time?

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AEGIS-MBL offer you CB with 3 months warranty and service backup by fully qualified and experienced technicians to protect your investment.

We've been in the communications business for over thirty years. Let our specialists advise you on the right choice of rig and accessories.

Midland 13-892

World famous market leader SSB/AM unit with RF gain control, dual detectors tone switch and clarifier which doubles as continuously variable delta tune Was $299.50.

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Midland 13-886 (below)

Dramatic modern styling combined with top class performance makes this the choice for an AM home base station Wired for 240V, has inbuilt SWR meter Use the handset for private conversation, switch to loudspeaker when required. Outstanding value at

$189.50

Tram Diamond 40

Most advanced AM rig on market 52 semi-conductor devices to reject noise and adjacent channel interference. Has mic. gain control, delta tune and inbuilt SWR meter Was $169.00

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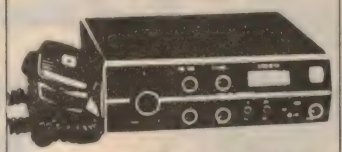
Hy-gain V

Review in June CB Australia magazine said "Outstanding in functional design and operation." SSB/AM with RF gain control, automatic noise limiter, noise blanker Was $279.50

Now only **$239.50**



Johnson Viking 352D

The ultimate in high level AM/SSB performance. Crystal lattice filtering rejects adjacent channel interference and a fully automatic noise limiter assures clean, clear reception. Built in microphone compressor and full allowable power ensure strong, crisp transmissions. Originally selling at $268.00.

Now only **$229.00**

Other models in stock

Including Bengal, Pace, Tasc, Finetone, Kraco, Unimetrics, Roberts, Xtal, Electrophone 18 Channel. Write, phone or call for further details. Special discounts to clubs, social organisations, etc. Trade enquiries welcome.

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Includes mobile antennas, base antennas, SWR bridges, TVI filters, Co-Ax cable and fittings, PA speakers, Mic compressors, RF amplifiers.

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Please supply urgently ☐ (Brand name)_____ CB unit @ $_____

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y for the ultimate nvest in CHIBA CB

THE DISCRIMINATING BUYER WILL ALWAYS LOOK FOR FIRST-CLASS, DEPENDABLE PERFORMANCE...THAT'S CHIBA

Why not move up to the ultimate -- the Chiba 18 channel AM SSB unit offering many of the finest CB features in Australia today.
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LOOK AT THESE GREAT FEATURES:

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- INTEGRATED CIRCUIT SPEECH PROCESSOR: Plus ALC, gives you maximum speaking volume on AM or SSB
- SEPARATE RF TRANSISTOR HEAT DISSIPATOR: Ensures even better performance and reliability
- NEW CLARIFIER CONTROL: Enhances clarity of reception on every channel and simplifies speedy adjustment from one mode to another. Adjusts SSB receiver frequencies, converts to AM variable fine tuning
- STRONG, MODERN, SOLID-STATE CIRCUITRY: Dependable chassis ensures reliable relay switching
- DUAL CONVERSION RECEIVER: 4 Ceramic filters for AM and one mechanical filter for SSB gives better SSB reception plus superior overall selectivity
- SPECIAL PA AUDIO CIRCUIT: This special integrated circuit PA Amplifier at the push of a button

PLUS ALL THESE IMPROVED FEATURES:

TX operating light, full size mike, bracket and 12 volt DC cord, automatic noise limiter with built-in amplified automatic gain control circuit reduce noise together, external speaker with PA speaker jacks.
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Chiba pioneered the PPL developments in CB and will continue through its innovative research and development to be a world leader in personal communications.

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THIS MAGAZINE'S CHIBA CB RADIO
OFFER No. 162/77.

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The Australian CB SCENE

What you've always wanted to know . . .

CBer's HANDY MANUAL. Published 1976 by Tab Books, Blue Ridge Summit, Pa, USA. Stiff paper covers, 48 pages 215mm x 139mm, mainly text. Price in Australia $2.75.

Only about 20 of the 48 pages in this little book are of direct interest to Australian CBers. Twelve pages or so are devoted to getting the best out of your mobile CB rig, and a couple pages to "10" code expressions. There's a page of "Q" code terms and four pages of CB jargon, much of which seems to have been imported from the USA, along with the CB concept. As the publishers explain: the book doesn't contain all the expressions you'll hear but it will help you start talking to the "natives"—a neat way of putting it!

The rest of the book is a reprint of the FCC 1976 (23-channel) regulations covering CB radio in the USA and, while some may be interested to reading the many pages of small print, they are not the rules which apply in Australia, which have yet to be spelt out in detail. So it's back to those first twenty pages!

Our copy of the book came from Technical Book & Magazine Company, 289-299 Swanston St, Melbourne, 3000. (W.N.W.)

☆ ☆ ☆

CB RADIO OPERATOR'S GUIDE 2nd Edition, by Robert M. Brown and Paul L. Dorweiler. Fourth printing, published February 1977 by TAB Books. Stiff paper cover, 256 pages 215mm x 136mm, freely illustrated by photographs and diagrams. Price in Australia $8.50.

If you want to know all about the Citizen's Band Radio Service in the USA, this very recent publication will tell you a great deal of it! Chapter 1, "Introduction to CB Radio" really sells the concept. Chapter 2 and a 50-page appendix explain the US licencing system which, of course, does not apply here. Chapters 3 and 4 on equipment discuss what is available in the USA but would apply obliquely to the local scene.

The chapter on antennas could be helpful—provided you don't start erecting high-gain beams—but other material on coaxial cable and connectors, installation, optimising your station and simple troubleshooting would all be applicable.

There is a chapter also on CB and Public Service which may point the way to its possible future role in Australia. In short, if you're hungry for background information on CB radio, this book will be read with interest.

Our copy came from Technical Book & Magazine Co, 289-299 Swanston St, Melbourne, 3000. (W.N.W.)

☆ ☆ ☆

CBer's HANDBOOK OF SIMPLE HOBBY PROJECTS by Robert M. Brown. Published 1976 by TAB Books. Stiff paper covers, 168 pages 208mm x 130mm, illustrated by circuit diagrams. Price in Australia $5.50.

I must confess to being intrigued by the title of this book and by the index

The Australian CB SCENE

list of 114 projects for CBers. Because CB equipment is supposed to be type approved, in America as in Australia, it is not all that open to modification or additions; how then could one possibly dream up 114 CB gadgets?

Looking through the pages, the question was answered—to this reviewer's satisfaction, at least! Had I had to vet the material before publication, I would have rejected a large proportion of the gadgets there and then. The tally would have been much, much smaller!

There are home-made transmitters (illegal?) and elementary receivers which I suspect would radiate. There are a number of microphone preamplifiers and other gadgetry supposed to increase talk power; they may also simultaneously overmodulate and/or distort and cause splatter! I doubt that some of the gadgets would work at all, like a neon bulb TVI detector and a noise limiter involving a neon bulbs across the speaker voice coil.

Dubious also are some of the antennas and associated gadgetry, including a diplexer which would feed some of a CB transmitter energy to the domestic TV antenna and the rest to the input circuit of the TV set itself! For sure, some readers may find a use for some of the other ideas but don't blame me if you are disillusioned. In short, a book I definitely would not recommend.

Our copy came from Technical Book & Magazine Co, 289-299 Swanston St, Melbourne, 3000. (W.N.W.)

☆ ☆ ☆

PICTORIAL GUIDE TO CB RADIO INSTALLATION & REPAIR. By Forest Belt. Published 1973 by TAB Books. Stiff paper covers, 256 pages 215mm x 137mm, freely illustrated by photographs. Price in Australia $8.50.

In the preface, the author stresses that there are three kinds of CB equipment repair: by do-it-yourselfers, by technicians who lack appropriate facilities and, lastly, by a relatively small number of technicians who have the appropriate experience and equipment. He remarks that the first two groups often end up with maladjusted transmitters and a heritage of radiated interference—this based on the American experience.

His aim here is to encourage technicians to be better informed about CB radio, and this is certainly appropriate to the Australian scene right now. Accordingly, the first five chapters cover such subjects as installing CB base stations, CB base antennas, coax cables, and CB mobiles, including antennas. At least half the space is taken up by pictures and, while some of the material has to be discounted as appropriate only to the US scene, the general problems are graphically illustrated.

The remaining five chapters deal with the service and instrumentation of CB transceivers, with individual coverage of transmitters, receivers, SSB circuitry and frequency synthesisers. Two of the chapters cover bench and field servicing.

While all this could be read with great interest by any technically inclined CBer, the target audience is primarily that of professional technicians and, for them, a book like this would be an excellent starting place. Our copy came from the Technical Book & Magazine Co, 289-299 Swanston St, Melbourne, 3000. (W.N.W.)

☆ ☆ ☆

PRACTICAL CB RADIO TROUBLE-SHOOTING & REPAIR by David F. Norman. Published 1975 by TAB Books. Stiff paper covers, 237 pages, 210mm x 130mm, illustrated by circuits and pictures. Price in Australia $8.50.

In some ways, this would be a companion book, rather than an alternative to "Pictorial Guide . . ." reviewed earlier, because the approach is quite different. It opens with two chapters on the origin and applications of CB radio and, while the story relates strictly to the USA, it does provide an interesting summary.

Chapter 3, some 38 pages long, gives quite an extensive coverage of CB antennas and, while the more elaborate types would not be permitted in Australia, there is a lot of useful background to the types that are. Chapter 5 also has something to say on antennas and anyone planning to get involved in CB radio repair should find this useful reading.

The chapters on equipment and facilities and for CB service, and on CB troubleshooting are fairly routine material, which shows its age by sundry references to valve stages. An appendix at the rear contains data and typical circuits, but this portion of the book—the last 50 odd pages—would have little relevance to Australia in 1977.

Of the two books on servicing, I'd much rather have Forest Belt's "Pictorial Guide . . ." but this present one could provide useful back-up reading.

Our copy came from Technical Book & Magazine Company, 289-999 Swanston St, Melbourne, 3000. (W.N.W.)

M/W Station Guide

The Australian Radio DX Club advise that they have a new publication titled "Medium Wave Guide" listing all m/w stations in Australia, New Zealand and Papua New Guinea known to be in operation on August 10, 1977. Frequency, power and schedules are given, and space is provided to permit possible additions and alterations. Price of the 17-page publication is $1.00 and orders should be directed to: 3 Kadana Street, Oak Park, Victoria 3046.

The Australian
CB SCENE

18-CH AM/SSB FROM CHIBA AUST.

Heralding the shape of things to come, a new Chiba 18-channel CB transceiver has just been announced, especially produced for the Australian market. Designated as model 69A, it offers full AM and SSB facilities on the 18 channels designated for use in this country.

First impression of the new Chiba transceiver is of a slim, modern unit — an impression largely resulting from the orderly layout of controls on the front panel. Push-buttons along the top select the PA/CB function, AM, USB (upper sideband) and LSB (lower sideband). They lead into a relatively easy-to-read meter indicating "S" points for receive and comparative power for transmit.

Immediately beneath the meter and providing visual balance is the Chiba nameplate and, alongside that, knobs for Clarifier, Squelch and Volume, with the microphone socket in the lower left-hand corner.

At the right-hand end of the panel, illuminated from behind, is the channel selector, with a transmit indicator LED at the bottom right-hand corner.

The 69A is of average size for an AM/sideband transceiver: 250mm wide, 56mm high and 232mm deep, not including knobs at the front or connections at the rear — the latter comprising a 50-ohm antenna outlet, 12V supply socket, and jacks for external CB speaker and PA speaker. The overall finish is in black wrinkle lacquer with chrome plated controls and trim.

Removal of four screws allows the covers to be slipped off, giving ready access to both sides of the PC board on which the vast majority of the components are mounted. Construction appears to be open and conventional.

According to the specifications, the circuit configuration also appears to follow along modern lines, the receiver being a double-change superhet, fully solid-state, with intermediate frequencies at 10.695MHz and 455kHz, and channel frequencies controlled by a phase-locked loop. Sensitivity for signal/noise ratio of 10dB is quoted as 0.7uV for AM and 0.2uV for SSB. Audio response is from 300 to 2,200Hz and rated audio power output 4W.

Conforming to normal CB regulation limits, the transmitter is rated to deliver 4W output on AM and 12W PEP on SSB, both into a 50-ohm load. Under normal conditions of use, modulation should be greater than 75%, and spurious emission more than 60dB below the main signal.

Connected to a normal 5/8-wave base station antenna, the 69A gave a commendable performance in receive mode with, perhaps, one peculiarity which warrants a mention: with the squelch fully open, the gain after the volume control in the receiver under test was such as to produce a residual hiss with the control right off. It might not have been audible under other than quiet conditions and did not affect normal operation, but we would have preferred it otherwise.

In transmit mode, into a dummy load, the power output appeared to conform closely to expectations and, to judge by a monitor receiver, was characterised by firm, clean modulation.

The Australian CB SCENE

CHIBA 18-CH AM/SSB — continued

The distributors are confident that the 69A transceiver will gain Australian type approval but official testing of all CB transceivers was being delayed, at the time of writing, by an industrial dispute affecting the licensing authority.

The 69A is being handled in Australia by a subsidiary company of Chiba (see EA for September, page 39) but inquiries should now be addressed to 12 Terracotta Drive, Blackburn, Vic. 3130.

(In fact, the 69A is being made the subject of an attractive introductory offer directly to readers of "Electronics Australia". Readers wishing to take advantage of this offer should study the advertisement elsewhere in this issue.)

CB AT THE C.E. SHOW

George Tillett, a well known hifi writer and a frequent contributor to "Electronics Australia", recently visited the Chicago Consumer Electronics Show and had the following to say about the CB radio exhibits:

As far as CB was concerned, there were some very mixed feelings: for one thing, sales of the new 40-channel models have not been as high as expected, partly because there is a huge backlog of something like three or four million 23-channel models left to sell. Consequently, prices of both 23-channel and 40-channel models have been ruthlessly cut!

On the other hand, companies like SBE and Texas Instruments have just introduced expensive and sophisticated models using MPU (microprocessor unit) technology with keyboard tuning, programmable memory, fast and slow scanning, emergency channel overide and other facilities. The TI model is a SSB unit and all the controls are in a small hand-held unit which looks just like a calculator. Readouts show the channel number, sideband mode and signal strength.

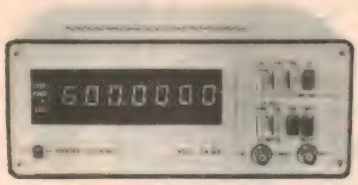
Hy-gain also make use of MPU circuitry in their Model 16 which has all the controls plus the loudspeaker built into a neat hand-held unit. Two push-buttons control the volume level and there are digital readouts for channel numbers, RF output power and the time!

The transceiver illustrated above is the Aircommand CB-640 40-channel model with LED indicators for channel number and metering, channel 9 scan, and SWR indicator.

One of the intriguing spin-offs of the CB boom is the increased interest in amateur radio in the USA. The ARRL reports that the licence figures now stand at 375,000 with 50,000 non-amateurs now enrolled in radio training courses.

HERE!

Plug this frequency counter into 240V AC or 12V DC and count up to 750 MHz.



Get 7 digit direct readout with high visibility ½" LED's
50 ohm and 1Mohm protected inputs.
Switchable 1 MHz low pass filter on the input. High stability internal time base, self check function and many more cost saving features.

The DFM 600 from Scientific Electronics is easy to use and easy to read – its low cost, coupled with high performance and versatility make it the ideal frequency counter for applications rangeing from production line testing, calibration, education, frequency monitoring to telecommunications and 2 way radio and video servicing.

The DFM 600 offers 240V or 12V DC operation. Counts up 750MHz. 50 ohm and 1 Mohm protected inputs. High stability internal time base. 7 Digit Direct Readout with Zero blanking. Switchable 1MHz Low pass filter on input. Self check function. 25 mV Sensitivity (high z input only). External oscillator input. Ratio measurement capability. Attenuators on input x1x10x100. Display update (gate) indicator. Overrange indicator.

Also available is the DFM 100, this is priced even lower than the 600 but still enjoys many of its excellent features – including 240V or 12V DC operation.

Designed and manufactured in Australia by:

Scientific Electronics

42 Barry Street, Bayswater, Victoria, 3153. Telephone: 729 3688.
Contact these distributors for prices and data –
Victoria, Electro Technics, 699 2716
N.S.W. Electronic Developments, 51 7007. S.A. Graphic Electronic Industries, 42 6655. Qld. Fred Hoe and Sons, 277 4311.
W.A. W.J. Moncrieff Pty. Ltd. 325 5722.

GEMTRONICS

CB Transceivers from BAIL

GTX-3336

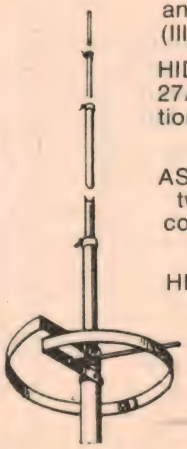
Delux AM 23 Channel transceiver featuring built-in range boost modulation, Automatic Noise Limiter, and Modulation indicator
$89

GTX-3325

Delux SSB/AM 23 Channel transceiver featuring built-in Range Boost Modulation, FET RF amplifier for high receiver sensitivity, Noise Blanker, RF gain control and large S-meter
15 watts PEP SSB, 5 watts AM
$269

also available from BAIL ELECTRONICS

QUALITY BASE STATION & MOBILE ANTENNAS



The original ASAHI "Million V1" ½ wave "Ringo" 3.75 dB base station antenna, still only $52. (Illustrated at left)

HIDAKA VS 10 GH ⅝ wave, 4.25 db 27/28 MHz, very rugged construction, 9ft radials, excellent value at $65.

ASAHI TD-1 "twin-trucker" phased twin mobile whips, $39 the set complete with mounts and co-ax harness.

HIDAKA VS-11cm three element heavy duty beam $89.

Plus mobile whips: Mag-mount, Gutter clip, Helicals, Motorised CB/AM/FM combinations. Also, antenna mounts, SWR meters, test sets, Low-pass TVI filters, Linear amplifiers, etc., etc.

TRADE ENQUIRIES WELCOME. Above prices include S.T. Freight and Insurance is extra. 90-day warranty. Prices and specifications subject to change.

Note all Transmitting Equipment requires a Licence.

bail ELECTRONIC SERVICES

60 Shannon St., Box Hill North, Vic., 3129. Phone 89 2213
Distributors in all states and N.T.

The Australian
CB SCENE

PHILIPS UHF PROTOTYPE

Following the announcement that they would be entering the UHF CB field, (E.A. Sept. p37) Philips have taken the further step of exhibiting their first production prototype and confirming the price at "about $300".

Designated as type FM320, the new transceiver is scheduled to go on sale in January next and should prove a boon to those who need 2-way CB-style communication — but not of the kind which presently characterises the 27MHz band.

Reception conditions on UHF will tend to be much quieter and more hassle-free for a variety of reasons. With little or no "skip" at these frequencies, local point-point communication will not be cluttered by distant signals or "DX" activities; atmospherics, ignition and other man-made noise will be much less troublesome; and there will be 40 channels over which to distribute the local traffic.

This much is an outcome of the use of a higher frequency band but Philips point out that, in addition, the move to UHF will make possible the use of frequency modulation in place of amplitude modulation or SSB, giving a further protection against noise, heterodyne effects and cross-talk. The standard of communication will approach more closely that of established 2-way radio services.

Another very significant bonus flowing from the use of UHF FM will be the reduction of interference radiated into neighbouring TV receivers, hifi systems and other electronic equipment. As in America, this has already reached the hassle stage in Australia.

Philips list a variety of features for their forthcoming FM320 transceiver including such things as:

- 40 channels provided;
- Digital channel display;
- Electronic channel change with variable stepping rate.
- Instant return to a preferred channel;
- 5-watt RF output;
- 2-watt audio output;
- Microswitch operated push-to-talk.

CREST AUSTRALIA: Following a meeting in September, the National Headquarters of CREST (Citizens Radio Emergency Service Teams) Australia is to be located in Canberra. Information regarding CREST should, in future, be sought through the National Secretary, David T. Wynn, at 157 Blamey Crescent, Campbell 2061.

Other office bearers elected were: National Director, Bill Payne, 10 Davis St, Glebe 2037; National Operations Director, John A. White, 86 Schlich St, Yarralumla 2600; National Treasurer, Jan Kuwahata, 36 Tobalum Rd, Balgowlah 2093. Also recognised was the Immediate Past National Operations Director, currently Dermot Lynch, 170 Enmore Rd, Enmore 2042; tel 02 519 1772.

IN THE USA, CB licence applications to the FCC rose to 3.25 million in the first half of 1977, up more than 10% from the 2.93 million filed in the first half of 1976, a record year for CB radio sales and licence applications. Approximately 11 million licences have been granted by the FCC since it began licensing CB in 1958, over half of them in the last 18 months, according to the Electronic Industries Association. EIA staff vice president John Sodolski estimates that "by 1980 there will be more than 50 million mobile citizens' radios in use in the US — approximately one in every other car — in addition to 15 million to 20 million base stations."

DELTA BASE CB RADIO of East Bentleigh, Vic, are manufacturing half-wave base station antennas under the new trade name of DX Products, at Healesville, Vic. They are also manufacturing 5ft helicals, bases to suit helicals and, as well, they distribute a wide range of CB hardware. Trade inquiries should be directed to DX Products, PO Box 386, Healesville, Vic 377.

Simple, inexpensive TV accessory:

Remote TV headphones

If you like to watch TV late at night without disturbing other members of the household, this little gadget may be just what you are looking for. You listen to the TV sound using either an earphone or a pair of headphones, without being tied to the TV by a bothersome cord. No modifications are required to the TV set, and the unit is simple and economical to construct.

by DAVID EDWARDS

The unit to be described in this article also has a use as a TV hearing aid for people who are hard of hearing. With slight modifications, it is possible to arrange for such people to hear the TV sound channel at a level higher than would normally exist in the room. Of course, this could be done simply with headphones alone, but normally this requires the listener to be "tethered" to the set.

With the unit described here sound information from the TV is transmitted to a self contained receiver unit by magnetic induction. To do this, a loop of wire is required around the perimeter of the room in which the device is to operate. This loop is fed with the required audio signal, and generates a magnetic field in the interior of the loop whose intensity varies with the audio information.

The receiver consists simply of a second loop, whose output is fed into a suitable voltage and power amplifier. In order to improve the efficiency of energy transfer, while keeping the receiving loop to small dimensions, it is wound around a section of ferrite rod. This enables the complete receiver to be housed in a small mini-box, measuring only 83 x 54 x 29mm.

The circuit details of the receiver are shown in the accompanying circuit diagram. The pickup coil consists of five layers of 30 B & S enamelled copper wire, wound on a 75mm length of 9.5mm (⅜") ferrite rod. The exact number of turns is not critical, and neither is the size of the wire used.

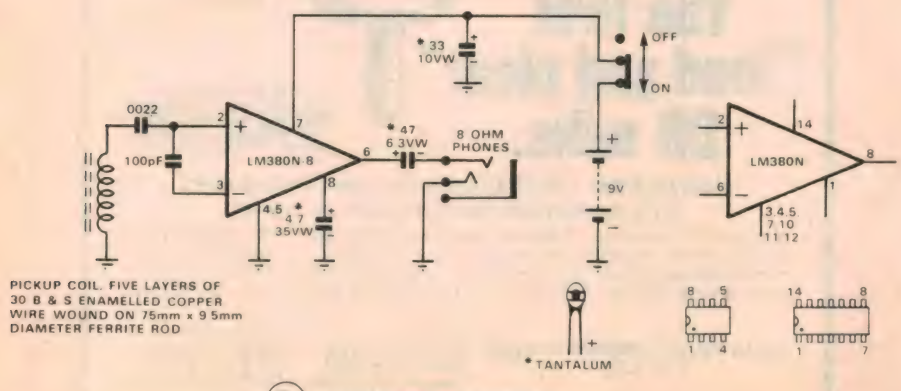
We have used an LM380 integrated circuit as the amplifier, as this gives a simple, reliable unit, using a minimum of parts. These devices have a fixed gain of 34dB, and are capable of driving an 8 ohm speaker or headphone directly. The output is short circuit proof, and incorporates thermal limiting. Either an 8 or 14 pin package is available.

We have tailored the input and output coupling capacitor values to limit the low frequency response of the receiver. This is required because of the large amounts of 50 and 100Hz hum and ripple which tends to be picked up by the loop. The 100pF capacitor connected between the inputs also rolls off the high frequency response above 5kHz, to prevent any stray 15625Hz TV line frequency signal from being passed to the headphones.

We have used tantalum capacitors for the supply decoupling and bypass units, as these are usually smaller than their aluminium counterparts. Power is supplied by a 9V battery, one of the 216 type units. A small slider switch is used as an on/off switch.

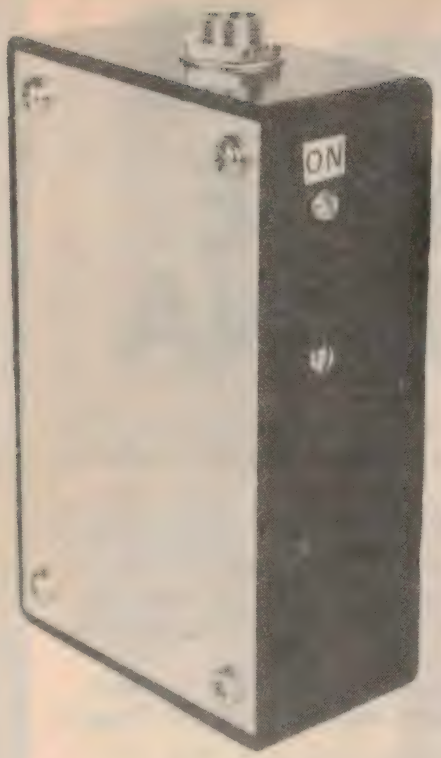
Construction of the unit should be within the capabilities of the average enthusiast, and does not require any specialized tools. We made up the transmitter loop using a 15 metre

BELOW: The circuit diagram of the receiver unit. Note the different pin connections of the two LM380 devices currently available.



PARTS LIST

1 LM380N or LM380N-8 audio amplifier
1 47uF 6.3VW tantalum electrolytic capacitor
1 33uF 10VW tantalum electrolytic capacitor
1 4.7uF 35VW tantalum electrolytic capacitor
1 0.0022uF polyester capacitor
1 100pF ceramic or polystyrene capacitor
1 length of 9.5mm (⅜") dia. ferrite rod
1 earphone socket
1 9V miniature battery and clip to suit
1 plastic minibox, 83 x 54 x 29mm
1 miniature slide switch
1 length of multiconductor cable
Veroboard, solder, 30 B & S enamelled copper wire, insulation tape, hookup wire.



length of six-way cable. This enables a six turn loop to be obtained fairly easily.

The accompanying photograph shows how we used a small piece of Veroboard to terminate the cable, and to facilitate the connection of the separate wires into a loop. When we had completed the loop wiring, we were pleasantly surprised to discover that the total loop impedance was about 8 ohms. This meant that no series resistor was required to match the loop into the TV receiver loudspeaker voice-coil circuit.

Alternatives to the type of cable we used include rainbow cable or telephone cable. The important parameter to consider when purchasing cable is the effective cost per metre. In other words, 12-way telephone cable at 60 cents/metre has an equivalent cost of 5 cents/metre, as against plain hookup wire at 8 cents/metre.

For permanent installations, the best place for the cable is behind skirting boards, under carpet, or even under the floor-boards. Check the resistance of the completed cable, and if it is less than 8 ohms, add sufficient resistance to bring the total resistance up to this value. Then fit a suitable cord and plug to the free ends of the loop, so that you can plug it into the earphone socket of your TV or radio.

The first step in the construction of the receiver is to cut the ferrite rod to the correct length, if you have not been able to purchase it already cut. Instead of using a new rod, it is possible to use an old aerial rod from a transistor radio. The existing coil may be pressed into service, although you will still require extra turns.

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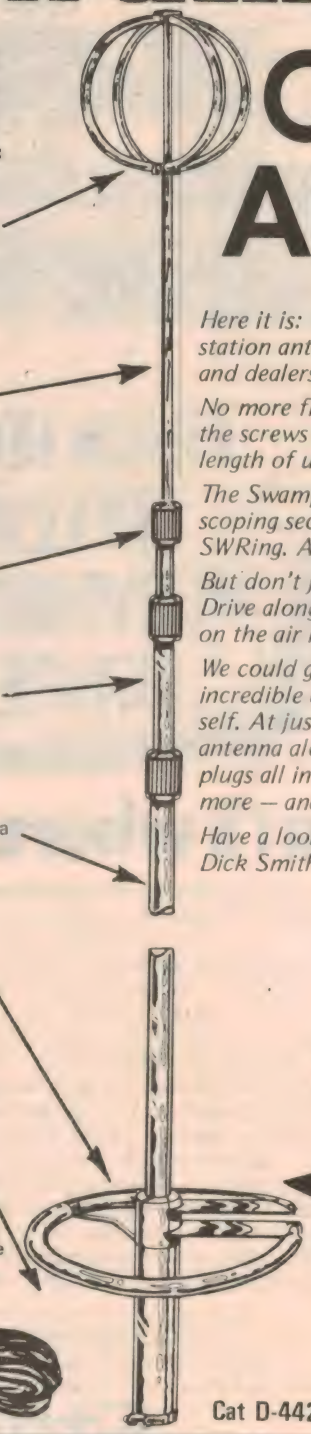

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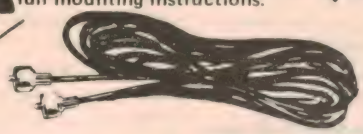

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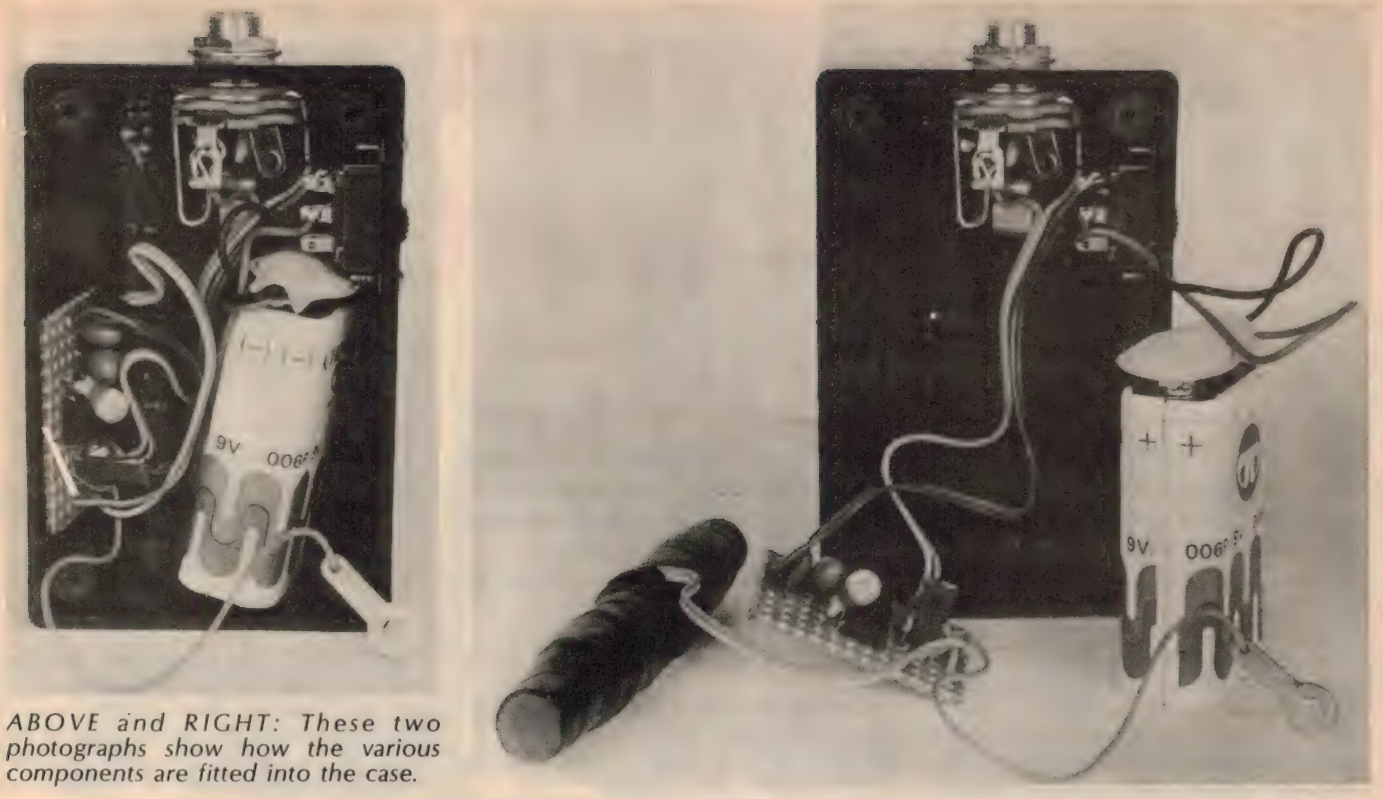


ABOVE and RIGHT: These two photographs show how the various components are fitted into the case.

To cut the rod, use a three cornered file to make a nick round the circumference, and then simply snap it in two. You will find that it will snap where the nick is. The wire can be wound onto the rod by hand, but this is very tedious. A better way is to use an electric or hand drill.

We used a two speed electric drill with a 9.5mm (⅜") chuck, along with a drill speed control. A suitable speed control was described in the July 1976 issue (File No. 2/PC/22). Clamp the drill to your bench, or in your vyce, and adjust the speed control to a very low speed (with the drill set for low speed as well!).

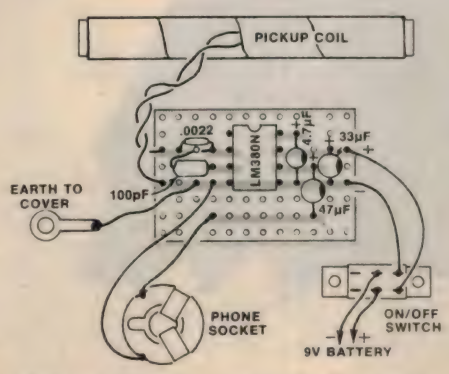
Anchor the start of the winding to the rod with a small piece of insulation tape, and then turn on the drill and commence to feed the wire onto the rod. Use an even tension, and make sure that the turns are wound on evenly, so that the second and subsequent layers will go on easily. When the fifth layer is complete, anchor the end with more tape, and then completely cover the coil with a layer or two of tape.

If you wish, you can solder the coil ends to short pieces of hookup wire, and then tape the joints thoroughly to the rod. This will provide a strong mechanical joint, and prevent the thin winding wire from breaking.

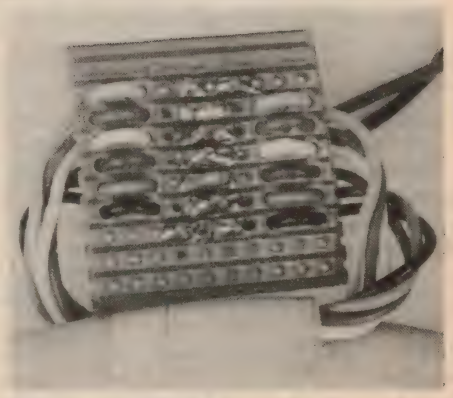
The LM380 is mounted on a small piece of Veroboard, along with the associated capacitors. The circuit diagram shows the connections for the two packages available. The smaller package cannot supply as much output power as the larger one, but is recommended on the grounds of cost, as it supplies ample power for headphones.

Use the photographs as a guide to the placement of the components, as there is not much room in the box. The headphone socket is mounted at one end, with the power switch near it. The rod lays along one side, with the Veroboard assembly lying at an angle over it. The battery is laid along the other side, near the power switch.

The aluminium lid of the box should be connected to the negative side of the battery, as otherwise spurious sounds are produced when it is touched. To test the completed system, simply try using it. With the volume control on the sound source set at a normal listening level, and the loop energised, sound should be heard in the phones whenever the receiver is inside the area of the loop. Note that the ferrite rod in the receiver must be held perpendicular to the plane of the transmitter loop, for maximum pickup.



ABOVE: Use this diagram to aid the placement of components on the Veroboard. A different layout is required for the 14-pin package.



ABOVE: This photograph shows how we terminated the transmitter loop onto a small piece of Veroboard.

The volume of the received sound can be varied by varying the volume of the TV or radio driving the transmitter loop. If required, a volume control can be fitted to the receiver by inserting a 500 ohm potentiometer in series with the phone jack

If it is required to drive the transmitter loop at the same time as the TV speaker, it will be necessary to connect the loop in series with the speaker. To do this will most likely require modifications to the set, and these should only be attempted by those qualified to do so.

Finally, we would like to point out that more than one receiver unit can be used with a single transmitter loop.

How to design transistor heatsinks

Transistor heatsink design is something of a mystery to most people, despite the fact that the basic principles are quite straightforward. This article explains how heatsinks work, and gives you all the information necessary to design and select your own.

by GREG SWAIN

An understanding of the basic principles involved in heat dissipation and heatsink design is important to anyone involved in the design and construction of semiconductor circuits. Semiconductors are temperature sensitive devices and, to ensure reliable circuit operation, care must be taken to ensure that circuit temperatures do not exceed certain critical limits.

The primary limitation on the power handling capability of any semiconductor device is the maximum temperature at which the device junctions will contunue to operate normally. This maximum temperature depends on the semiconductor material used, and for silicon may run as high as 200°C.

The actual temperature that the junction will reach in circuit operation depends mainly on two factors. These are:

(a) the amount of power being dissipated in the device; and

(b) the rate at which heat can be removed from the junction.

More specifically, the temperature reached by the junction of a diode or transistor is the sum of the ambient temperature and the rise due to generated heat energy. And the temperature rise due to the heat generated depends upon the ease with which the heat may be dispersed away to the ambient. The easier it can flow away, the lower the temperature rise of the device, and vice-versa.

The heat removal process can be made more efficient by mounting the device on a metal dissipator or "heatsink". Aluminium is the preferred material because of its high thermal conductivity and light weight. Heat energy is then transferred from the device case to the heatsink by conduction and removed from the heatsink itself by conduction, radiation and convection.

One way of thinking of a heatsink is to consider it as a thermal inpedance matching device. The small device case represents a relatively high thermal impedance, while the ambient surroundings represent a very low impedance. The coupling between the two without a heatsink is thus rather poor, due to the mismatch.

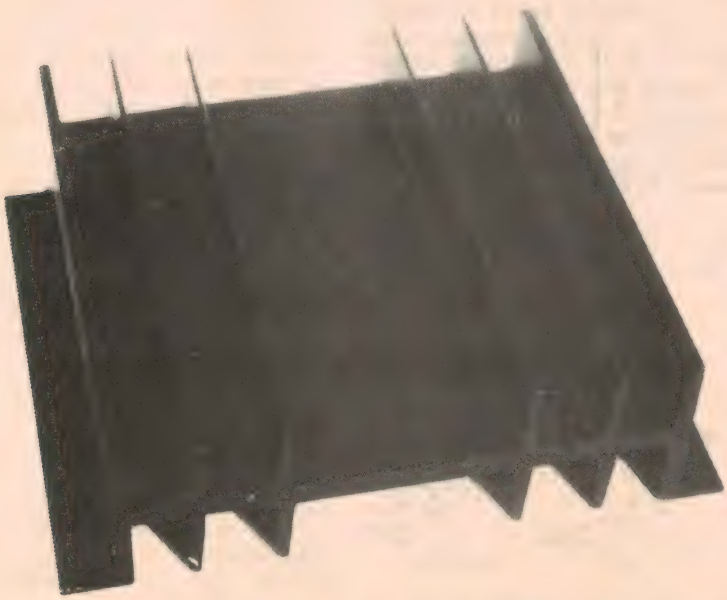
To explain further, it is easier for heat energy to be transferred from the device to the heatsink and thence to the surrounding air than it is for heat energy to be transferred directly from the device to the air. The closer the impedance match, the more efficient the heat removal process, and the lower the device temperature.

In practice, the thermal impedance depends on the design and size of the heatsink. As a general rule of thumb, the larger the heatsink, the lower its thermal impedance. Obviously, there is a practical limit to the size of heatsink that can be employed, and the problem facing the equipment designer is one of finding the correct heatsink for the job on hand.

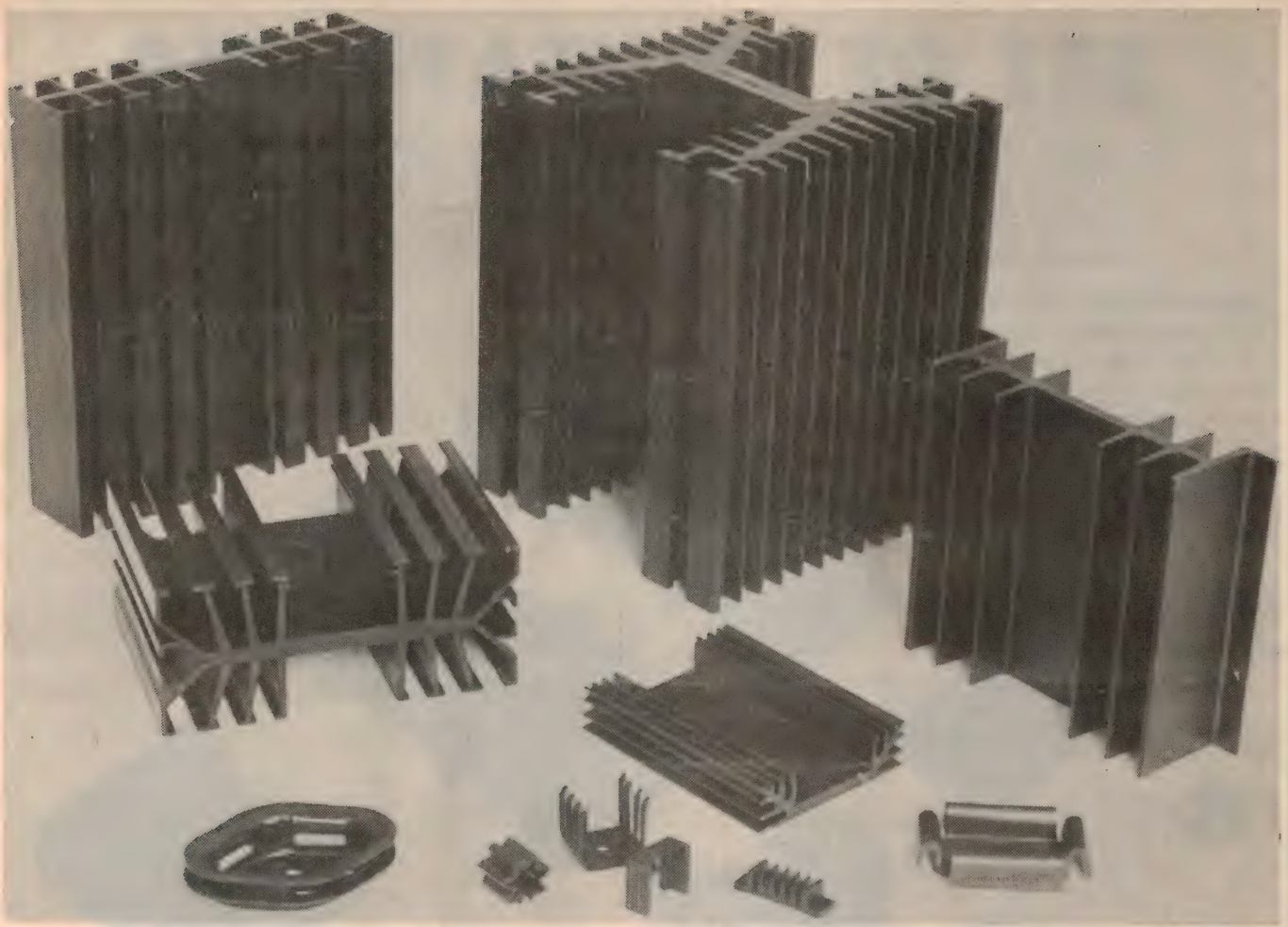
The most convenient way of describing the relationship between temperature rise and the ease with which heat can be removed from a device is to use an electrical analogy. By equating temperature rise with voltage and heat energy flow with current, then the relationship which links the two can be considered as "resistance"—or, in this case, thermal resistance.

We can now link these three factors into the thermal equivalent of Ohm's Law:

$T = P \times K$ ..... Eqn (1)



76mm length P-type heatsink from Redpoint. Thermal resistance is 2.8°C/W.



A selection of heatsinks from the Redpoint range. Thermal ratings are specified by the manufacturer.

where T is the temperature rise, P is the heat energy flow, and K is the thermal resistance.

The actual operating temperature of our diode or transistor junction can thus be calculated by simply adding the product of heat flow and thermal resistance to the ambient temperature:

$Tj = Pdiss \times Kj\text{-}a + Ta$ .....Eqn (2)

where Tj is the junction temperature in degrees C, Pdiss is the heat flow (equal to the power being dissipated in watts), Kj-a is the total thermal resistance between the junction and the ambient, and Ta is the ambient temperature (also in degrees C).

The total thermal resistance Kj-a has a value which depends on several factors. These include the size of the device junction, the method of mounting within the case of the device, the type of heatsink used (if any), and the method of removing heat energy from the heatsink. In practice, the total thermal resistance Kj-a can be considered to be the sum of a number of different thermal resistances.

Once again, a simple electrical analogy can be used to illustrate this last point. This is shown in Fig. 1 which gives an equivalent circuit for the thermal resistance between the junction and the ambient:

$$Kj\text{-}a = Kj\text{-}c + Kc\text{-}s + Ks\text{-}a$$ .....Eqn (3)

where Kj-c is the thermal resistance between junction and case, Kc-s is the thermal resistance between case and heatsink, and Ks-a is the thermal resistance between the heatsink and air.

Eqns (2) and (3) are the basic equations from which we can readily calculate our heatsink requirements. The maximum allowable power dissipation for a device is specified by the manufacturer, as is the maximum junction temperature Tj (or alternatively the junction-to-case thermal resistance). The ambient temperature for which the equipment is intended is known by the designer.

Note that maximum power dissipation is usually specified for a case temperature of 25°C. This is because the device manufacturer has no way of knowing what type of heatsink will be used with the device. The above equations allow the user to calculate the extent to which the device must be derated for higher case temperatures.

The case-to-heatsink thermal resistance Kc-s depends upon the way the device is mounted on the heatsink. If the device is properly mounted on the heatsink, and no insulating material is used between the two, the heatsink will be at the same temperature as the device case and Kc-s will be effectively zero. More often than not though, the device case must be electrically insulated from the heatsink material, and for this purpose a thin mica washer is normally used.

A thickness of about .002" of mica is generally considered adequate for insulation, resulting in a value of about 0.5°C/W for Kc-s. A thin smear of silicone grease is usually applied to both sides of the mica washer before mounting in order to improve the thermal bonding.

The problem of choosing an ap-

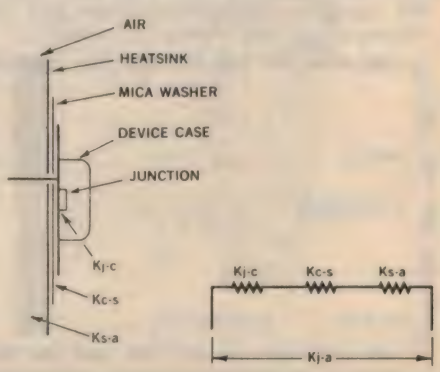


FIG. 1

SET OF 12 HEATSINKS

If you're an experimenter, technician or radio amateur building up electronic equipment, this bargain pack of well-known "Redpoint" heatsinks for transistors and other semiconductor devices is for you. It offers 12 heatsinks, selected from those most often used, and together with a jar of mounting compound — at a price much lower than you'd normally have to pay. All have the standard black matt finish, for optimum heat dissipation, and the PCB types are drilled for standard device mounting.

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2 x type TV 4 (TO-126 size, 17°C/watt)
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1 x jar of mounting compound

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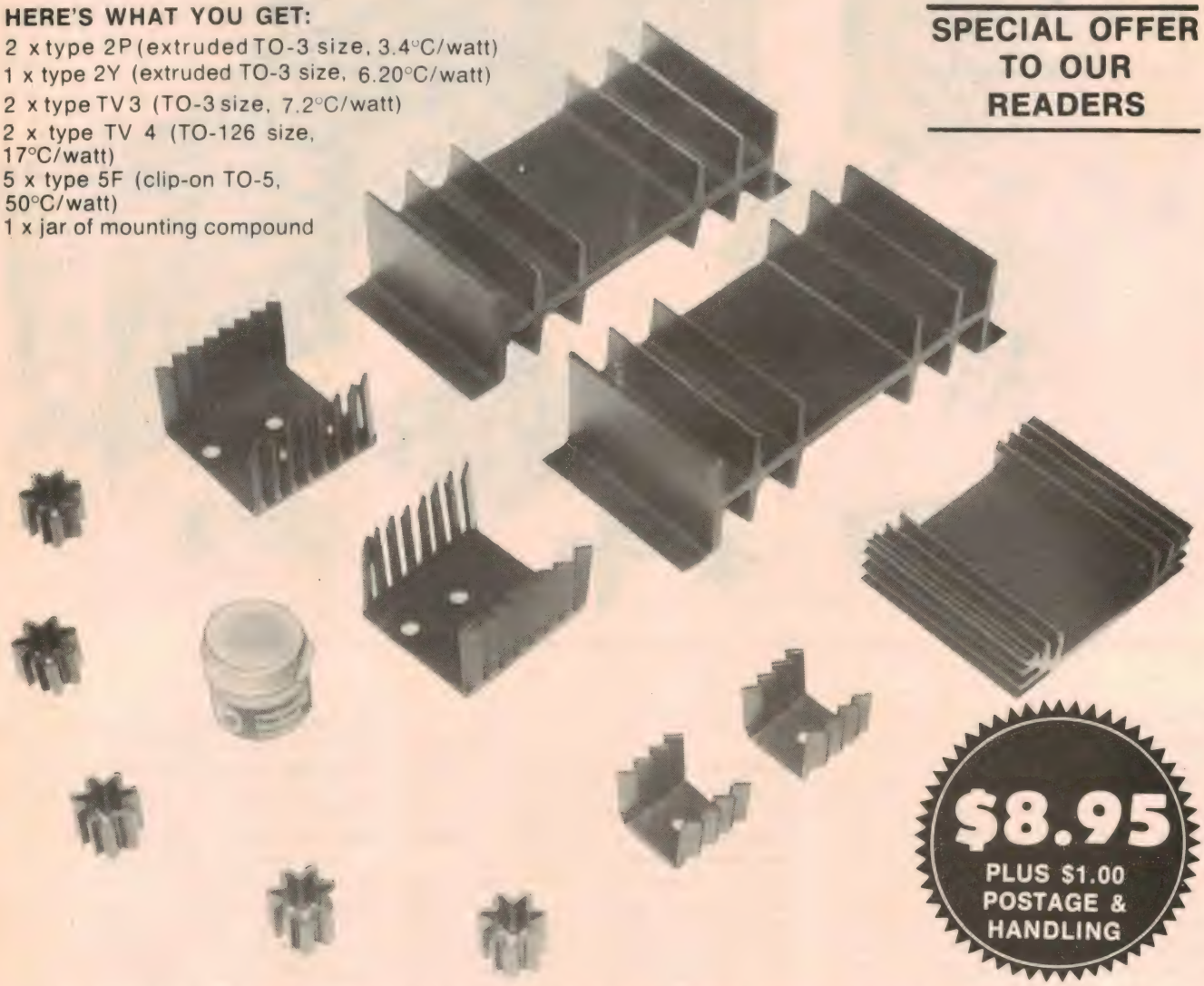

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propriate heatsink for a given design situation thus reduces to one of determining the maximum allowable heatsink-to-air thermal resistance Ks-a. This we can do by combining equations (2) and (3) to get an expression for Ks-a:

$$Ks\text{-}a = (Tj - Ta)/Pdiss - Kj\text{-}c - Kc\text{-}s \quad \text{.....Eqn (4)}$$

The use of this formula can best be illustrated by working through a simple example. Consider a transistor (eg 2N3055) with a rated Pdiss of 115W at a case temperature of Tc = 25°C and Kj-c of 1.52°C/W, operated on a heatsink in an ambient air temperature of up to 35°C. We wish to design a suitable heatsink to enable us to dissipate 20 watts in the transistor junction.

The maximum Tj for this device would be 1.52 x 115 + 25 = 200°C. The maximum Ks-a we could allow for the heatsink would thus be:

$$Ks\text{-}a = (200 - 35)/20 - (1.52 + 0.5)$$
$$= 8.25 - 2.02$$
$$= 6.23°C/W.$$

This assumes the use of a mica washer between the case of the device and the heatsink, with a thermal resistance of 0.5°C/W.

We can now go further by calculating the temperature differentials across various parts of the thermal circuit of our example, and thus the temperatures reached by the heatsink and the device case. The temperature reached by the heatsink is given by Ts = (Pdiss x Ks-a) + Ta = (20 x 6.23) + 35 = 159.6°C. Similarly, the temperature reached by the device case will be Tc = (Pdiss x Kc-s) + Ts = (20 x 0.5) + 159.6 = 169.6°C.

In a practical situation, the calculated Ks-a value would be derated in order to provide a safe operating margin. For example, our calculated Ks-a value of 6.23°C/W could be derated by choosing a heatsink with a Ks-a rating of, say, 4.2°C/W.

Again, in a practical situation, there may be a maximum heatsink or device case temperature which is tolerable from a design aspect. This will be particularly so in those instances where the heatsink is exposed to the equipment user, and the temperature must be limited for safety reasons. A situation familiar to most readers is when the series-pass regulator transistor of a bench power supply is bolted to an exposed heatsink, or to the metal case.

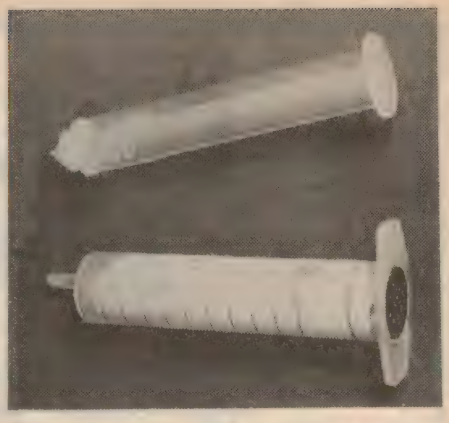
Let's now assume that under normal load and regulation conditions, our regulator transistor (2N3055) dissipates 10 watts. And let's also assume that, for safety reasons, the maximum permissible case temperature of the device is 60°C, and that the ambient temperature is 35°C. What is the maximum Ks-a for a heatsink that will satisfy these conditions?

The first step is to calculate the temperature of the heatsink. Now Tc = (Pdiss x Kc-s) + Ts which gives Ts = 60 − 5 = 55°C. Also, Ts = (Pdiss x Ks-a) + Ta, which on rearranging gives Ks-a = (Ts − Ta)/Pdiss = (55 − 35)/10 = 2°C/W.

There are several types of heatsink in common use. Among the most popular are flat vertical plates, flat horizontal plates, and finned vertical extrusions. The equipment chassis often makes a convenient heatsink. The thermal characteristics of commercially produced heatsinks are normally specified by the manufacturer.

The accompanying photographs show a variety of finned heatsinks from the popular Redpoint range, together with some Ks-a ratings. From these the reader will readily appreciate that quite hefty heatsinks are required if temperatures are to be kept low, even for moderate power dissipation.

The Redpoint range, by the way, is distributed by General Electronic Services Pty Ltd, 99 Alexander St, Crows Nest 2065. The most popular types from the range are available through electronics retail outlets.



Silicone grease, packaged in a syringe-like tube for ease of application.

Redpoint TV4 heatsink. Thermal resistance is 17°C/W.

For many situations though, it is unnecessary to resort to the expense of commercial heatsinks. Adequate heatsinks can often be made by the hobbyist or home constructor out of sheet aluminium. Table 1 shows the Ks-a to be expected from various sizes of 18G aluminium sheet.

The figures quoted assume a central mounting position for the device and free air circulation around the heatsink. Other gauges may of course be used, the thinner gauges increasing the thermal resistance and the thicker gauges reducing it. For 24G material about 1°C/W should be added to the figures shown, whereas for 14G material 0.5°C/W can be subtracted.

Note that the ratio of width to height of the heatsink should not exceed 2:1.

The table also highlights the advantages of vertical mounting and putting a flat black finish on the heatsink. A word of caution about painting a heatsink, though. Make sure that the thinnest possible coating is used, as the paint can act as an insulator around the heatsink if applied too thickly. This will result in a Ks-a which is higher than the untreated aluminium, defeating the whole purpose of the operation.

Table 1: Thermal Resistance of heatsinks in °C/W

AREA (sq. cms)	HORIZONTAL PLAIN	HORIZONTAL BLACK	VERTICAL PLAIN	VERTICAL BLACK
13	52	27	45	25
26	27	15	23	14
39	18	10.5	15	11
52	14	8.5	13	7.5
65	12	7	11	6.5
97	9	5.5	7.5	5
129	7	4.5	6.5	4
194	5.5	4	5	3.5
260	4.5	3.5	4	3.25
323	4	3	3.5	3

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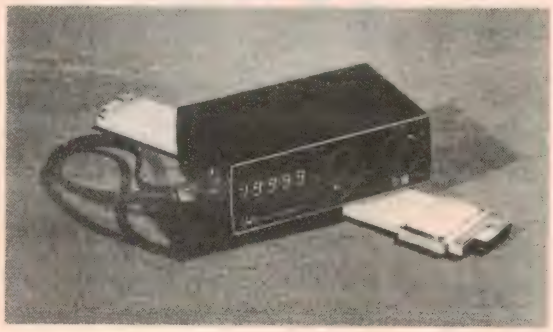

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Conducted by Ian Pogson

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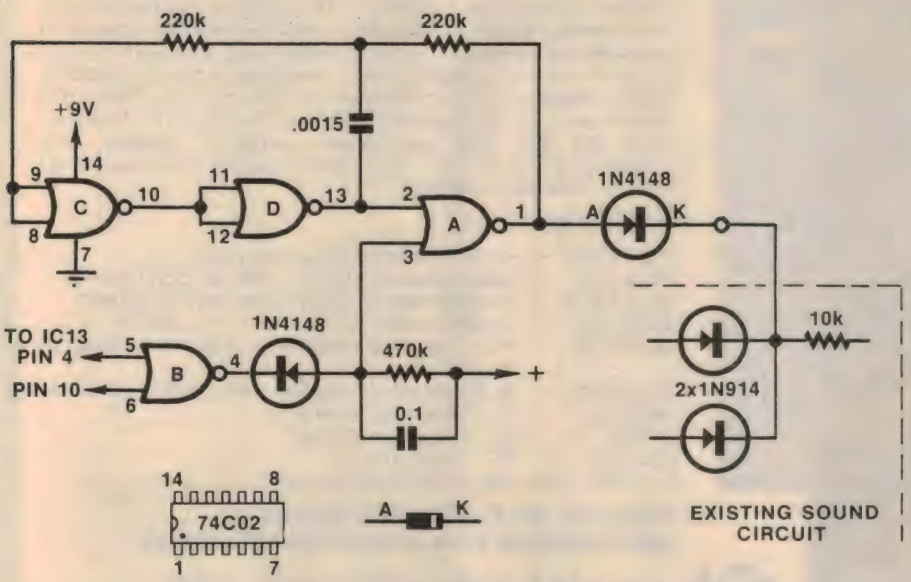
Video ball game sound addition



The Video Ball Game, described in May, 1976, and the add-on unit for sound, in November 1976, both work very well, the sound providing added realism. The sound unit, however, did not incorporate a provision for sound when the ball bounces off the top and bottom walls. The circuit shown here provides this facility without modification to either of the previously published circuits.

The oscillator (gates A, C, D) is gated on when gate B detects coincidence between the ball and either the upper or lower walls. This pulse is inverted and stretched by the RC network at the output of gate B. The diode ensures that the capacitor is charged only via the 470k resistor.

Constructional layout is not critical but the usual precautions regarding the handling of CMOS devices should be observed. Power should NOT be applied until pins 5 and 6 of the IC are properly connected to the Video Ball Game (pins 4 and 10 of IC13). I used ¼W resistors and "greencap" capacitors.

(By Mr P. M. Jardine, 31A Queen Street, Caloundra, Qld 4551.)

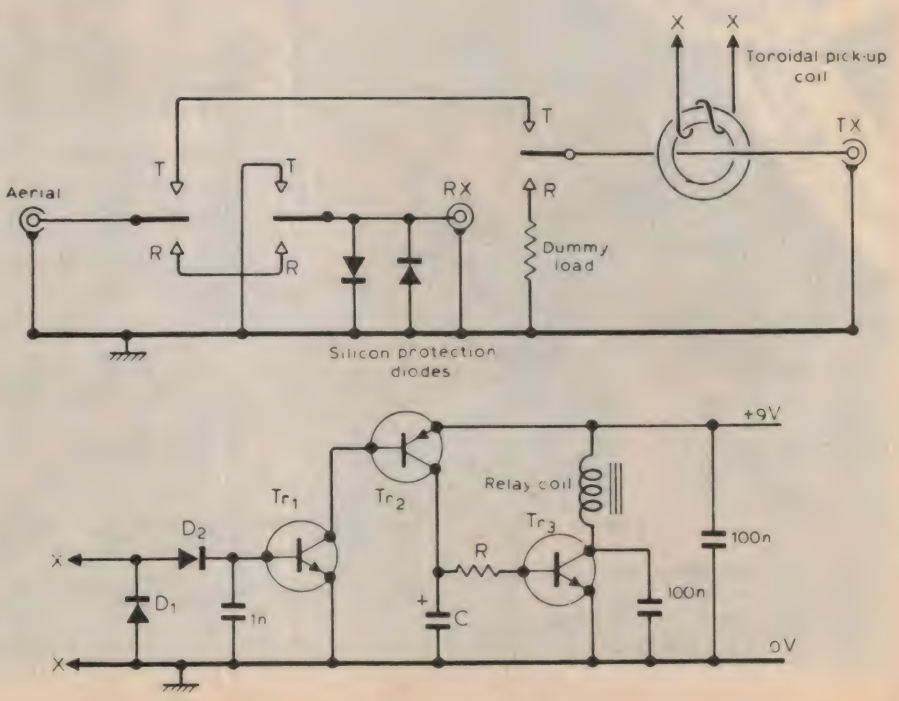
RF operated aerial switch

This aerial switch offers good isolation and negligible attenuation without the use of high voltage bias supplies. The unit is simply connected into the aerial lead and no connections are made to the receiver or transmitter power supplies.

When an RF signal appears in the dummy load, a sample is picked up by the coil, rectified, and used to turn on the transistor circuit. The relay then changes to transmit. When the RF ceases the discharge of C produces a small delay so that the relay only switches at the beginning and end of a CW transmission. The switch to transmit is rapid and a 100uF x 15k produces a delay of two seconds when switching to receive.

The few turns on a toroid is sufficient for a pickup coil with an output of 1W. In the receive condition the circuit requires only 30uA so a battery can be left in circuit. With short leads and the unit mounted in a screened case, the circuit functions from 1.8MHz. The transistors are general purpose silicon types but D1 and D2 should be germanium.

(By I. Braithwaite, in "Wireless World".)



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M.359/G — Right angle connector — PL.259/G to female
MP.4/G — 4 pin microphone plug
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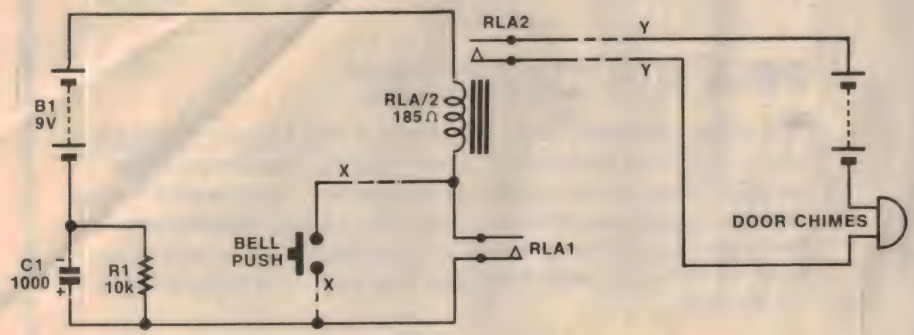
Door chime inhibitor



The unit to be described was designed to thwart the efforts of those bent on destroying the author's sanity. There are various ways of abusing door chimes—all of them annoying. Since most door chimes are loud enough to be heard with just one "ding-dong", the following circuit was devised and which allows only one "ding-dong". Further pressing of the button will give no results until about 20 seconds have elapsed.

The circuit consists of a general purpose relay, a resistor of about 10k and an electrolytic capacitor of about 1000uF. On pressing the bell-push, the relay is energised and the capacitor begins to charge up from the 9V supply. This charging current falls off as the capacitor charges and, typically, takes about one second for the relay to drop out to its original state.

The relay switches the chimes via RLA2, which remains closed just long enough to give the initial ding-dong. If this time is too short or too long, a different value of electrolytic capacitor can be tried, or a different relay used. A higher value of capacitor will give a long ding-dong, while a smaller value will give a shortening effect.

Further operation of the bell-push will fail to work the chimes because the capacitor will be left in a charged state and cannot be charged further and so will not allow sufficient current to flow to energise the relay. Under such conditions the capacitor would take a long time to discharge sufficiently to render the circuit operational again and so a resistor of 10k is placed across it.

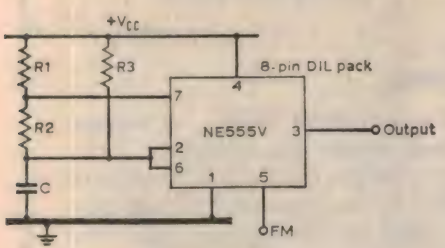
If it is required to shorten or lengthen the time, a lower or higher value resistor could be used, but a more flexible arrangement is to use a small preset variable resistor of about 100k, which could be adjusted to give the desired time factor.

Another feature of the circuit is that even a very short press of the bell-push will give a full ding-dong. This is because a second set of contacts (RLA1) on the relay short circuits the bell-push while the relay is energised.

Basic operation may be checked, without connecting the unit to the chimes, by listening to the clicking of the relay. Final checking and setting up may be done by making the necessary connections to points X-X and Y-Y, as shown in the circuit.

(From "Everyday Electronics".)

Oscillators using 555 devices



Many circuits have been published using the well known 555 timer IC as an oscillator, but nowhere does there seem to be any mention of the fact that under certain conditions 555 oscillators do not!

Generally, this malfunction seems to occur when the supply is switched on, although once persuaded to oscillate they carry on quite happily. A couple of years ago, after a colleague and I spent several days trying to get to the bottom of this problem, I telephoned the makers. They obviously knew about the problem, described the reason for the failure to oscillate, and suggested cures.

The condition results from the design of one of the voltage comparators and could be changed by a single change in chip layout; in fact the LM555 from National Semiconductor appears to incorporate this change but apparently those from other manufacturers do not.

The recommended cure by the makers was to put a diode or high-value resistor in series with the connection to pin 2 of the 8-lead DIL pack. Although the timing error drift of the basic 555 is quoted as 50ppm/°C, adding such a diode ruins the otherwise good temperature stability, not the most helpful of suggestions!

To retain the good stability and yet ensure a ready start, I have devised the circuit as shown. To ensure that the oscillator starts every time, R2 and R3 are chosen so that the potential at pins 2 and 6 exceeds 0.5V even when the transistor connected to pin 7 is saturated. The formulae for frequency of oscillation and duty ratio are, however, rather more involved than the simple ones quoted for the conventional circuit.

(By Richard J. Harris, G30TK, in "Radio Communication".)

Note on car battery monitor

In Circuit & Design Ideas for September 1977, the resistor values for the Car Battery Monitor were omitted. They are: R1, R3, 10k ¼W; R2, R4, R5, 1k ½W; R6, R7, 2.7k ¼W; VR1, VR2, 10k trimpot. My apologies for omitting this vital information.

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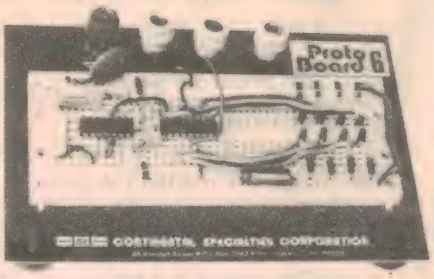

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How to charge nickel-cadmium batteries

The increasing use of nickel-cadmium batteries in tape recorders, calculators, flash units, etc, has created a growing interest in the characteristics of these batteries and, in particular, how they should be charged. This article discusses the charging requirements and describes a simple charger.

by PHILIP WATSON

A frequent request in our mail is for a charger "suitable for nickel-cadmium batteries"; usually without any additional information as to the voltage or capacity of the battery concerned. The implication seems to be that a charger for nickel-cadmium batteries needs to have some special characteristic and that, once this is provided, the charger automatically becomes suitable for any nickel-cadmium battery.

As is usually the case, there is an element of truth behind these ideas, but also a lot of misunderstanding. To put the record straight, let us take a brief look at the nickel-cadmium cell, and its charging requirements.

A nickel-cadmium cell, regardless of size, has a nominal voltage of 1.2 over most of its discharge cycle. When being charged, and at the prescribed rate, this will rise to about 1.5V at the end of charge. This will drop to about 1.3V after the charger is disconnected, and to 1.2V on load.

The first consideration, as with any battery, is the charging rate. If this is excessive, the battery can be damaged. The rule for nickel-cadmium batteries is quite simple: they should be charged at not more than the 10-hour rate. This is the rate which, in theory, should fully charge them in 10 hours.

A typical example is the "AA" size cell with a capacity of 450 milliamp-hours, which should be charged at 45mA. And, because the charging function is not one hundred per cent efficient, the actual charging time is 14 hours. This rule, a charging current equal to one tenth of the capacity figure for 14 hours, can be used for any nickel-cadmium battery.

The next consideration is more or less peculiar to the nickel-cadmium battery, although it is practised a good deal, largely by default, on other types of batteries. This is the requirement to provide a constant-current charging characteristic. As the term implies, this simply means that the charging rate should remain essentially constant over the whole charging period.

When a battery is charged in this way the voltage will vary over the charging period. In any particular set-up the voltage can be used, with a little experience, to give at least a rough indication of progress of the charging cycle.

The opposite to this characteristic (not recommended for nickel-cadmium batteries) is constant-voltage charging. As the term implies, it means maintaining an essentially constant voltage across the battery terminals for the whole of the charging period.

Several small boxes will suit the charger, that shown being the Davred No. 2. Note the two-pin polarised bracket.

This method results in a varying current rate over the charging period. Again, it is possible, with experience, to judge progress of the charging cycle by the current flow.

The advantage of constant-voltage charging is that the charge rate is high at the beginning of the charge, when the battery is flat, and tapers off to little more than a trickle as the battery approaches full charge.

When the battery is flat most of the energy fed into it is usefully employed in changing the chemical composition of the plates, and very little is wasted as heat or gas — two conditions which damage a battery.

As the battery approaches full charge a lesser proportion of the charging energy can be usefully employed, so it is necessary to reduce the charge rate to avoid excessive heat and gas. By charging at a (correct) constant voltage this reduction or "tapering" of the current occurs automatically. (This method is sometimes called "tapered charging".)

The main advantage is that the battery is charged in the shortest possible time, consistent with good battery life. It is particularly suitable for lead acid batteries and, in fact, the modern automotive regulator system simulates this condition, at least within the current capability of the generator or alternator.

On the other hand, as already noted, this method is not suitable for the nickel-cadmium battery. As with all batteries, there will be some temperature rise at the end of charge and, in the case of the nickel-cadmium cell, this causes the voltage of the battery to drop slightly.

Since the charge rate is a function, among other things, of the battery voltage, such a drop will cause an increase in charge rate. This will raise the temperature still further, cause a further voltage drop, greater charging current, etc, in a vicious circle or thermal runaway condition which can damage the battery.

In practice most simple chargers, particularly those used for large batteries, fall somewhere in between the constant-voltage and constant-current concept. Usually, it is sufficient to ensure that the charging rate at the end of charge is not excessive, after which its behaviour over the rest of the period is simply accepted.

Providing a constant-voltage or constant-current characteristic obviously involves something rather more elaborate than a basic charger circuit. Of the two, constant-voltage is probably the more difficult to provide but this is of little interest for this exercise.

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The calculator case styling of the Model 6000 permits maximum versatility and convenience. The carrying handle folds forward as a protective display cover, and may be folded fully back to serve as a tilt stand for convenient bench top viewing. the color-coded range plate may be removed to provide access to the input fuse and batteries as well as calibration adjustments. Routine operation requires only the selection of appropriate units of measure and AC or DC mode. Auto zeroing and autoranging circuitry eliminate other user adjustments for fast, convenient measurements at maximum accuracy.

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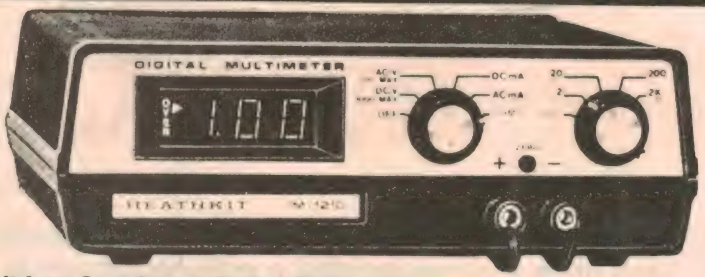

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IM-1212 SPECIFICATIONS: Functions: DC volts, DC current, AC volts, AC current, Ohms. **Ranges (Full-Scale):** DC volts: 0-2, 20, 200, 1,000 V; DC current: 0-2, 20, 200, 2,000 mA; AC volts: 0-2, 20, 200, 700 V rms (50 Hz to 10 kHz). AC current: 0-2, 20, 200, 2,000 mA rms (50 Hz to 10 kHz). Ohms: 0-200, 2K, 20K, 200K, 2M ohms. **Overrange:** 25% on all functions, within maximum input limits. **Maximum Input:** 3 amperes into AC or DC mA, and Ohms (fuse protected). 700 VAC rms into Volts (except 2V range: 250 VAC rms). 1,000 VDC into Volts (except 2V range; 350 VDC). "–" input may be floated 1000 VDC (700 VAC) above earth ground. **Resolution (Low Range):** Volts: 10 mV. Current 10μA. Ohms: 1 ohm. **Display:** 2½-digit, 7-segment, planar, LED (light emitting diode) with overrange and negative-input indicators. **Accuracy (Full Scale, ± 1 Digit): DC volts:** ± 1%. DC current: ± 1.5%. AC volts: ± 1.5%. AC current ± 2%. Ohms ± 1.5%. **Input Impedance:** 1 megohm on all voltage ranges. 2.1-volt drop maximum on current ranges (except 2.5-volt drop on 2,000 mA range). **Sample Rate:** Line frequency. **Display Settling Time:** Less than 1.0 seconds on DC volts and DC current, and less than 3.0 seconds on AC volts, AC current, and ohms; to within 5 counts. **Power Requirements:** 200-270 VAC 50 Hz, 8 watts. **Fuse Requirements:** Input: 3AG, 3-ampere. Line: (⅛-ampere slow-blow for 240 VAC.) **Dimensions (overall):** 3.00" H x 8.69" W x 10.54" D. (7.62 cm high, 22.07 cm wide, 26.77 cm deep.) **Weight:** 3.3 pounds (1.5 kg).
NOTE: The Multimeter requires a warmup time of 30 minutes to meet specifications.

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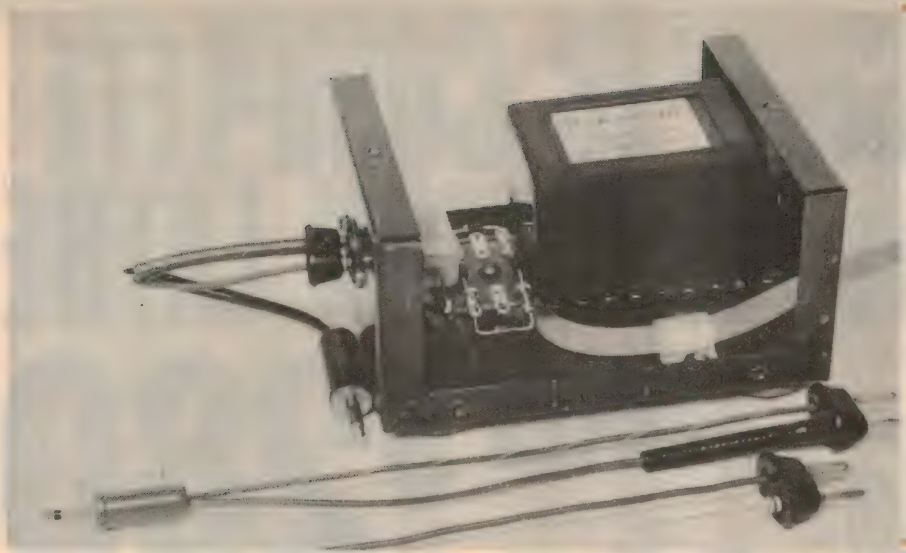


The simple layout of the charger is obvious in this picture. A battery lead is plugged into the charger and a second one is alongside it. A third one, partially completed, shows how the resistor is accommodated in the plug.

PARTS LIST

1 transformer; 240V primary, 15V secondary. (Ferguson PL15/5, DSE 2155, or similar.)
1 metal box, approx 100mm x 80mm x 55mm (Davred No. 2 or similar)
1 miniature tag strip, 13 pairs of tags
4 silicon power diodes, 1A
2 ½in spacers, tapped ⅛ Whit
1 2 pin polarised plug and socket (McMurdo or similar)
1 3W resistor and other resistors, as needed. See text.
3 core power cable, cable clamp, 3 pin power plug, hook up wire, nuts and bolts, rubber feet, etc.

stantially constant current is to start with a charging voltage a good deal higher than we require, then use a lot of resistance in series with this supply to control the current. With a lot of resistance in circuit minor variations in battery voltage (which also oppose the flow of current) become relatively insignificant.

The objection to this arrangement is the waste energy, in the form of heat, which must be dissipated. To provide a reasonably constant current flow we need to start with at least twice the voltage required, which means that we will waste as much energy heating the resistor as we will use to charge the battery.

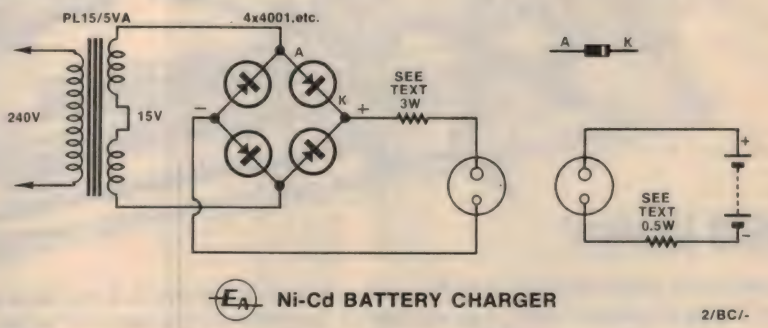
This problem is not serious for small batteries, such as the "AA" type used in calculators, small flash guns, etc. Four such cells would require approximately 6V to charge them and if we provided twice this and developed 6V across the dropping resistor, this latter would have to dissipate less than 0.3W.

Even a tape recorder using, say, five "C" cells is still a reasonable proposition. On the basis of a 7.5V battery, a charge rate of 180mA, and 7.5V developed across the resistor, the latter would still dissipate only a little over 1.3W.

The next size cell, the "D", needs to be charged at 400mA and, assuming a similar number of cells, would call for a series resistor dissipating 3W; enough to be embarrassing in many configurations.

Fortunately, most of the interest in nickel-cadmium applications involves the smaller cells, making it relatively simple to provide a satisfactory charger.

In practice, it is possible to design a charger which can be made quite versatile and able to serve a wide variety of cell sizes and combinations. This is done by budgeting, initially, for the highest voltage and highest current likely to be required; say five "C" size cells (as used in a typical tape recorder)



The circuit is extremely simple and calls for very little comment. Almost any power diodes with a 1A or higher rating will be more than adequate, even when using the larger transformer to charge quite large cells.

needing 7.5V at 180mA.

Such a charger could then be used to charge any battery of fewer or smaller cells up to, and even beyond, the five cell arrangement. All that is required is to increase the current determining resistance until the required charge rate is provided.

There are a number of ways of arranging this in practice. One method, used commercially, is to provide a multi-position switch giving a number of pre-selected charge rates, typical of commonly used cell sizes.

Another arrangement, which the author has used, is to provide a separate charging lead for each appliance or battery pack, this lead containing the necessary additional resistance to suit the battery concerned. The charger is fitted with a two-pin polarised socket, into which the appropriate lead is plugged. The other end of the lead carries whatever plug is needed for the particular appliance and, if necessary, can be tagged to identify the appliance.

To reduce the physical size and dissipation of the resistor in the lead, part of the total resistance can be inside the charger. Normally, this would be the amount required for the largest battery. In most cases this will keep the individual lead resistors within the ½W rating, and facilitate fitting them to one or other of the plugs.

The charger we are about to describe is based on these ideas, and is built around components readily available on the local market. It can use one of several transformers designed to deliver 15V AC at between about 300mA and 1A. On the basis of a five cell battery (7.5V at full charge) this will provide at least twice the required voltage.

The transformer we actually used was the Ferguson type PL15/5. This has two secondary windings, each delivering 7.5V at 330mA. They can be connected in parallel to provide 7.5V at 660mA, or in series to provide 15V at 330mA. We used the latter connection.

An alternative transformer is the type DSE2155 from Dick Smith. This has a variety of tappings from 6.3 to 15V at 1A. It is physically a little larger than the Ferguson model, but would still fit in the case we selected. The higher current rating could be an advantage where larger cell sizes, such as the "D", were involved.

The case can be any one of several simple two-piece sheet metal boxes which are readily available. We used one from Davred, known as their No. 2 box, which measures 105mm x 82mm x 54mm. Other boxes having similar

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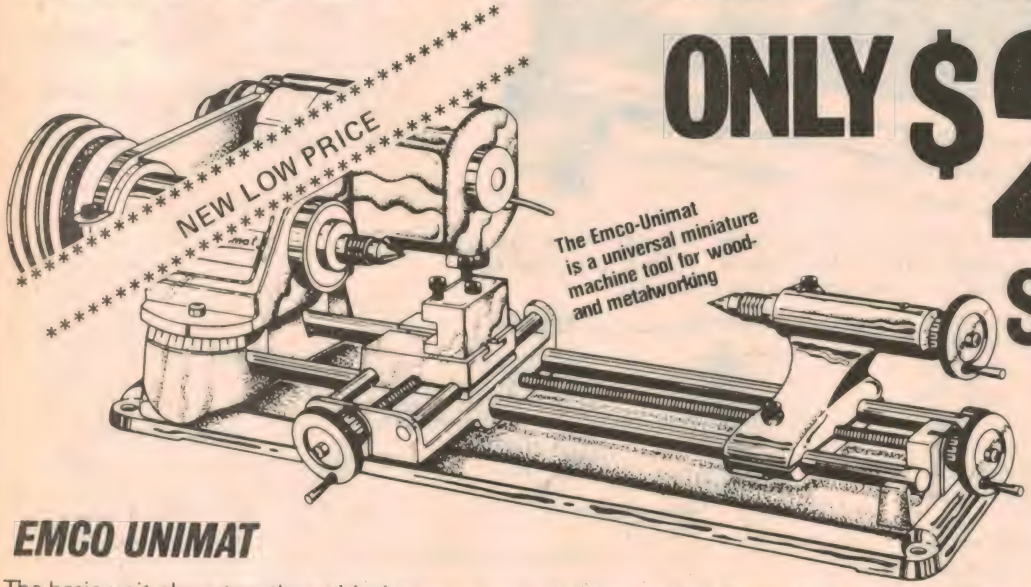

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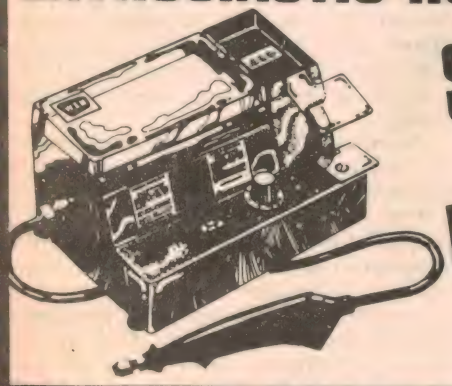

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dimensions should be quite suitable.

The Ferguson transformer is designed for printed board mounting, but a printed board could not be justified for a simple project like this. We used a short length (13 terminals) of 28mm wide tag board. The tags are spaced about 6mm apart and about 19mm between the rows. These dimensions are fortunate, because they match up almost exactly, in both directions, with the terminal pins on the transformer.

All that is necessary is to bend the two inner terminal pins of the secondary windings flat against the transformer case and lying beside one another. Soldered together they complete the series connection and, at the same time, allow the transformer to lie flat on the tag board. All the other pins will pass through the tag board holes and can be soldered.

The tag board is supported on two ½in long brass spacers, tapped ⅛in Whitworth, secured to the bottom of the box. The length of the strip is such that four pairs of tags protrude beyond the transformer at the secondary end. These support the four diodes in a bridge configuration, and the main series resistor.

The power cable is secured with a plastic cable clamp and passes through the box via a grommeted hole. The earth lead (green, or green and yellow) is terminated on a solder lug clamped under the spacer at the primary end of the transformer.

The output is via a 2-pin polarised plug and socket, such as the McMurdo type which we used. Where resistance has to be added to the lead, a ½W resistor may be partly buried in the hole in the base of the plug. A short length of insulating tubing can be pushed over it to protect its junction with the lead.

(To facilitate fitting plastic tubing over the resistor, try soaking the tubing in lacquer thinners for a few hours. This tends to both soften and expand it. After fitting it will shrink to its normal size as it dries.)

Many appliances have a socket intended either to permit charging or to permit a power pack to be used. In the latter case the internal battery is normally disconnected when the plug is inserted, but it is usually a simple matter to bridge the appropriate terminals on the socket so that the battery remains connected, and can be charged via this socket.

(Note: It is risky to operate the appliance in this mode. If the battery should be accidently disconnected, due to a faulty contact, an excessive voltage could be applied to the appliance, with possible damage.)

The amount of resistance needed for any particular battery can be determined experimentally, but a preliminary calculation will help, and can be quite accurate. Using Ohm's law, simply divide the voltage to be developed across the resistor by the charging current required. For example: five "C" cells require 7.5V at 180mA. Assuming a supply voltage of 15, 7.5V needs to be developed across the resistor. Divided by 0.18A, this gives 42 ohms. Assuming this was the largest battery to be charged, this resistor would be fitted internally and should have at least a 3W rating.

To charge 4 "AA" cells at 45mA add 150 ohms in the external lead or, for two cells, add 220 ohms. An even smaller battery is a very small 9V type,

An alternative transformer, available from Dick Smith. It would be suitable for charging rates up to 1 amp.

similar to the type 216 carbon-zinc battery. This can be readily accommodated and requires a lead resistor of 620 ohms.

For those who may be dubious about their ability to perform these calculations we have prepared a table showing calculated values for typical cell combinations.

These values should be checked experimentally and, if any small adjustment is required, this is best done when the battery is fully charged. Variation in current over the charging period should not be more than about 10%.

Finally, the box should be fitted with four rubber feet to protect any surfaces on which it may be placed.

For those not familiar with battery charging in general, or nickel-cadmium types in particular, it will help to get the "feel" of the battery and charger if the voltage is monitored during charging, at least for the first few times the battery is charged.

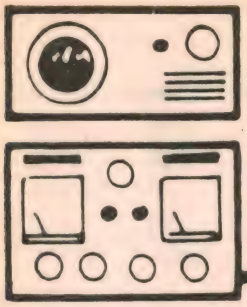
RESISTANCE TABLE

Size	Capacity	Charge Rate	1 cell	2 cells	4 cells	5 cells
N	150mAH	15mA	900	800	600	500
AA	450mAH	45mA	300	270	200	166
Sub C	1.2AH	120mA	112	100	75	62
C	1.8AH	180mA	75	66	50	42
D	4AH	400mA	33	30	22	18

The figures in the four right hand columns indicate the total resistance (in ohms) required for a particular combination of cells. As indicated in the text some of this resistance is best located inside the charger. Note that not all cells of the same physical size have the same capacity or charge rate. In all cases the instructions on the cell should be followed.

The voltage should rise slowly over the charging period and the battery may be regarded as fully charged when it reaches between 1.4 and 1.5 volts per cell, or when the voltage shows no appreciable rise over a period of, say, one hour. This provides a useful indication where the exact condition of the battery is uncertain when it is placed on charge.

In fact, the voltage may actually fall slightly, as already explained. This may be discernable on an ordinary voltmeter if the pointer is well up the scale, but calls for careful observation. An expanded scale voltmeter is better, while a digital voltmeter is better still. But, even without these refined versions, voltage measurement is still a most useful guide to the progress of the charge.



The Serviceman

Detecting intermittents needs time and patience

Taking things for granted is probably the most common single mistake of which we, as servicemen, are guilty. And, while it is easy to be wise after the event, it is one of the lessons which experience should teach us. My main story this month is a typical example.

The story concerns a valve type monochrome TV set, in which the main complaint was intermittent rolling, mainly on Channel 2, according to the customer. (I always treat such information with a certain amount of caution; in many cases the trouble appears to be worse on one channel simply because that is the customer's favourite channel!)

More important was the information that the set would sometimes go for days, or even weeks, without a sign of trouble. Then it would go all temperamental and slip a frame every few minutes for hours at a time — not a situation calculated to encourage relaxed and enjoyable viewing.

Naturally this was no job for the customer's lounge room. Intermittent faults need all the facilities which can be provided in the workshop, including time; time to let the set run and for the fault to show up.

On the bench the set decided it was not going to misbehave; a not uncommon situation with intermittents. So I simply set it up at one end of the bench and made a few routine measurements while it was working correctly. Such information can be vitally important when the fault does appear.

This set used one half of a 6Y9 twin pentode as the video amplifier, with the other half as the gated AGC stage. Signals from the plate of the video amplifier went to the cathode of the picture tube and to the sync separator stage, a 6CS6.

I concentrated on this latter stage, making voltage measurements and CRO pattern observations, and comparing these with the maker's circuit data. As far as I could see, everything was as it should be so I left the set running with the CRO connected to the sync separator input and a VTVM on the plate.

The set ran for several hours without missing a beat, while I busied myself with other jobs. Then it started to slip frames, and I dropped what I was doing and made a quick check on the CRO and meter.

The meter wasn't much help, but the CRO indicated that the sync pulses were varying in height quite significantly and, when they dropped low enough the picture would start to slip a frame, or even roll continuously.

Before I could do much more the fault vanished again, and nothing I could do would restore it. So I simply moved the VTVM to monitor the plate of the video amplifier stage, and went back to the other jobs.

Over the next couple of days the fault came and went in its own capricious manner, with yours truly taking every opportunity to narrow down the fault area. It didn't take me long to suspect the video amplifier. For one thing the CRO indicated that the sync pulses coming out of it were quite unreliable when the fault was present, though they remained constant at the grid. At the same time the voltages around this stage were kicking up and down in a quite unpredictable manner.

The first thing I did was to replace the valve, choosing a time when the fault was present. The fault vanished as the new valve warmed up, but I have been caught too many times to put much faith in such an occurrence. Sure enough, some time later the fault appeared again, ruling out that possibility.

Convinced that it was in the video stage I began a systematic examination of all associated components — screen resistor, cathode resistor, associated bypasses, and so on. None of this was to any avail; as far as I could test them all the components were above suspicion, yet I was convinced that the fault was in this stage.

Having reached such an impasse, I just sat and looked at the wiring, hoping for some inspiration. And that is just what I did get. This set was one of the relatively few designs, during the valve era, which used printed boards and the 6Y9 socket was an appropriate type mounted on the board.

I began to examine it closely and, when I came to the screen pin of the socket, I thought I detected a faint dark ring between the pin and the solder. A check with a jeweller's glass confirmed my suspicion; the pin was sitting in a little hollow of solder which barely touched it in one or two places, but had obviously never wetted it.

I confirmed the situation by exerting gentle pressure on the pin with an insulated prod and established that I could make the fault come and go at will. That was proof enough, and I knew that another intermittent was about to bite the dust.

In fact, I kept the set for another day, just to make sure, but there was never any real doubt in my mind. When it ran the whole day without even blinking, I returned it to the customer. A follow-up call a couple of weeks later confirmed that it was still behaving.

In some ways this fault was almost a routine one, as intermittents go, but there are a few points worth noting. One was the length of time that the set had been in the field, probably 10 years at least, during which time it performed without trouble until the last few months. This is not unusual with dry joints, in fact they almost invariably show up in old equipment and, I suspect, probably result in a significant number of such old units being written off as having reached the end of their useful life.

Another point is that we invariably get caught when we take too much for granted. How often do we trace a voltage up to a socket and take it for granted that, from there on, all is well. Most times it is, of course, but when all else fails don't forget that sockets, of all kinds, can fail.

This next story concerns a technician employed by a colleague. He passes it on in the hope that it may avoid a similar situation and, perhaps, a fatality.

The technician concerned made a house call to a colour TV set, the complaint being no picture or sound. He removed the rear cover from the set, checked an appropriate point for HT, and found there was none. Suspecting the switch mode power supply, he decided to try a spare one which he

carried as part of his kit. He unplugged the leads, removed the protective hardware, and slid the power supply out of its casing.

The next instant he received a terrific "belt" and the power supply fell from his grasp onto the lid of his toolbox, printed side downwards. There was a bright flash and a loud bang, as the printed board made contact with the toolbox lid. The whole thing happened in a split second.

After regaining his composure, the technician examined the power supply for possible damage. The first casualty was a 2A fuse in the line going from the rectifiers and filter capacitor to the collector of the chopper transistor. He also noticed that several components in that area had blackened soldered joints with most of the solder removed.

So he set to work cleaning and resoldering the suspect joints on the board. After completing this, he again tried the supply in the set, and this time it worked.

Whether the blown fuse was the original cause of the trouble, or whether it blew when the filter capacitor discharged, he will never know, nor will he know if another fault, such as a dry joint, was the real cause of the trouble, as this incident happened about a month ago, and the set is still working. One thing is for sure however: the technician is a sadder but wiser man for his experience.

This illustrates the dangers involved in careless handling of these units. The main filter capacitors can range in value from 200 to 400uF and can be charged to something like the peak of the mains voltage: typically 325V.

Years ago, when I was a young lad in a factory, it was customary to play practical jokes with charged capacitors. By a kind of unwritten law we limited our activities to the 0.5uF variety; they were quite large enough to deliver an unpleasant shock, yet not so large as to involve any kind of risk.

In spite of the unwritten law, however, I was caught a couple of times with 8uF electrolytics and anyone who has experienced it will confirm that they can deliver a very nasty wallop. Yet this would be a mere tickle compared with the jolt from even 200uF which, in the right circumstances, could possibly be fatal.

Before working on these power supplies, discharge the main filter capacitors through a resistive load. A unit made from a household electric light globe, a suitable lampholder and a pair of well insulated test prods is satisfactory. Above all — be careful. Your first slip may well be your last.

And, to finish off, here is another brief thought on the matter of safety.

A colleague rang me the other day in a mild panic. It seemed that he had bought a roll of three core power cable, with the idea of replacing some appliance cords that had seen better days, only to discover that the conventional red, green and black wires had been replaced with blue, brown, and green with a yellow trace.

"I've heard about an alternative colour code," he confided "but this is the first time I have had to use it. Just what are the equivalent colours?"

I had to admit that I couldn't quote them off the cuff either, but I seemed to remember that I had filed a pamphlet issued by the NSW Electricity Commission. Sure enough, a few minutes' digging brought it to light and I was able to pass the information on to him.

But do you know what the alternative colours are?

In fact, they are sufficiently logical to make them reasonably easy to remember, if one really puts one's mind to it. Fairly obviously, the green with a yellow stripe, replaces the old plain green. The old red is replaced by the colour which most nearly resembles it, i.e., the brown, and the old black is replaced by the colour closest to it — the blue.

Also, it appears that there is a variation on the pattern for the earth lead. In some cases the yellow stripe is straight, in others it has a spiral pattern. Either arrangement is correct.

So there it is and you had better make a note of it; it looks as though progress (?) is catching up with us.

Electronic scanner

In order to overcome the mechanical problems associated with rotating loudspeaker systems for electronic organs, we have devised this all-electronic device for simulating both the fast and slow speeds usually provided with the mechanical systems.

by IAN POGSON

Over the past couple of decades or so, the electronic organ has gained tremendous popularity in private homes as well as its increasing use in public halls and churches. However, a great majority of electronic organs generate the tones from either one master oscillator, or 12 top octave oscillators — and then divide down with mathematical precision to all the lower octaves. Because of this the sound can be rather bland and uninteresting.

By contrast, every note from a pipe organ comes from an individual pipe, toned to its correct nominal frequency. No matter how well the tuning is done there are slight errors, due to the tuning procedure itself as well as changes in weather and other conditions. Rather than being a problem, provided that the errors are not too great, this situation gives a sound with subtle multiple random beats. This is generally pleasing to the ear and adds considerable interest to the music produced on the particular instrument.

In order to remedy the deficiency of tonal interest in electronic organs, manufacturers have resorted to a number of different methods. In a few cases, the makers have elected to use a separate oscillator for every note. However, with this system, there may be upwards of 60 separate oscillators and when tuning becomes necessary, the task is a formidable one.

Apart from this approach, other techniques used include artificial reverberation, electronically produced vibrato, and some type of mechanically arranged rotating loudspeaker or reflector system.

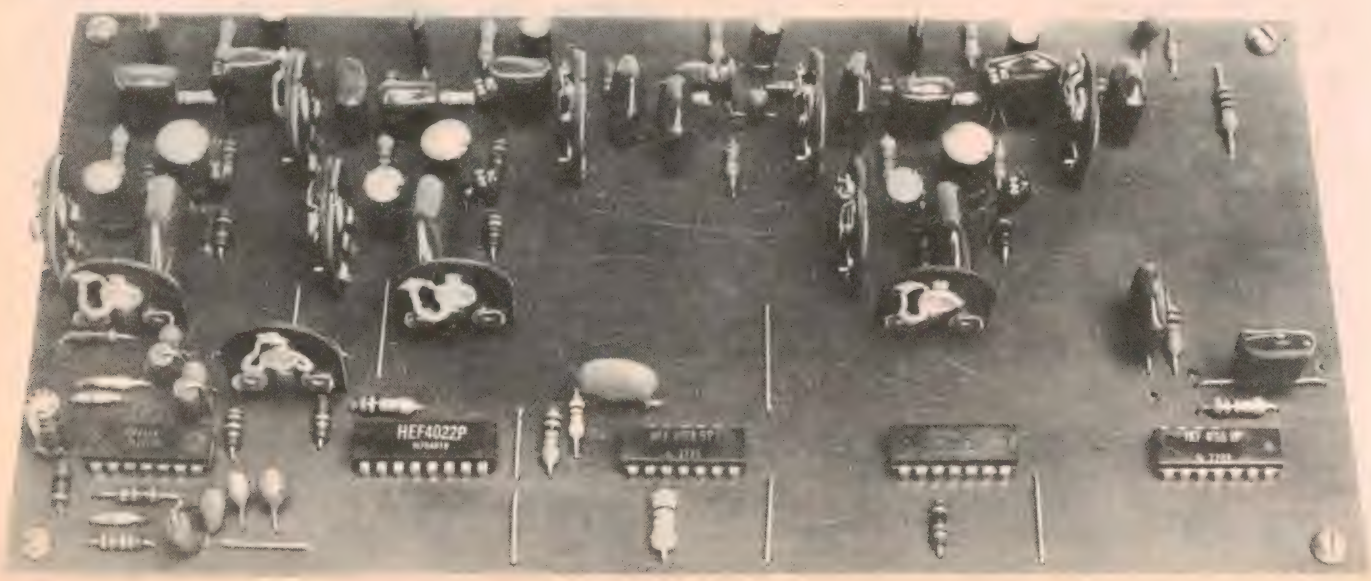
It is the mechanically rotating loudspeaker system which claims our particular attention here. This system is generally arranged by adjustment of an electric motor and pulley drive arrangement to give two speeds. The higher speed gives about seven revolutions per second, or a little over 400 revolutions per minute. The low speed is often about one tenth of this figure, or about 40 revolutions per minute.

The higher speed gives a deep throbbing tremolo effect, often associated with the theatre organ of years gone by. The low speed is somewhat more subtle in its effect and is inclined to give the illusion of the tones being slightly off precise tune, together with that "rolling" sound which some of us have experienced when in some of the large cathedrals in Europe and elsewhere.

Suffice it to say that either effect can be very useful when associated with the appropriate type of music. Having established the desirability of a system giving these effects, as borne out by the fact that very large numbers of electronic organs have been fitted with these devices in the past, let us take a closer look at the subject.

If your organ is fitted with a rotating speaker system, well and good. However, there are some organs which are not so fitted and the owner may wish to add one of these devices. There

A single PC board accommodates the complete circuit of the scanner.



for organs

PARTS LIST

1 Printed board, 204m x 101m, code 77sc11
1 LM3900 quad amplifier IC
1 4022 CMOS counter/divider IC
2 4001 CMOS quad 2-input gate ICs
1 4016 CMOS quad bilateral switch IC
7 Transistors, BC549, BC209, BC109
1 Zener diode, BZX79C12

RESISTORS
(½W unless stated otherwise)

2 1k	1 22k trimpot
3 1.8k	3 100k
3 2.2k	3 100k trimpot
4 2.7k	1 220k trimpot
3 3.3k	1 330k
3 4.7k	1 470k
8 5.6k	3 820k
4 10k	4 1M
6 10k trimpot	4 2.7M
5 22k	3 4.7M

CAPACITORS
1 100pF polystyrene or ceramic
3 .01uF 200V greencap
13 0.1uF 200V greencap
3 0.33uF 200V greencap
4 0.47uF 35VW tantalum
1 1uF 35VW tantalum
2 4.7uF 35VW tantalum
5 10uF 10VW electrolytic
3 47uF 6.3VW electrolytic
3 100uF 6.3VW electrolytic

Note: Resistor wattage ratings and capacitor voltage ratings are those used on the prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, providing the ratings are not exceeded.

is also the second situation where an organ may or may not be fitted with a rotating speaker system, and the owner may wish to provide an external "tone cabinet" for one reason or another. He may wish to have a rotating speaker system included in the external cabinet.

In either case, without going into details of the construction of an external cabinet, with its amplifiers and speakers, one is faced with the need to make up a largely mechanical device, with its need for perhaps a couple of suitable electric motors, pulleys and the necessity to change from one speed to another. Quite a daunting prospect, coupled with the fact that unless the mechanics are very good indeed, when in operation there will be an unacceptable amount of rumble and other noise.

Another characteristic which generally accompanies the mechanical rotating speaker is the rather lengthy time it takes to change from one speed to the other. This has been exploited in some kinds of popular music but in the main, it is a feature which most of us could do without.

For a couple of years or so, I have been thinking over the idea of simulating the rotating speaker effect by electronic means. Some preliminary experiments were tried, using electronic switching of three or four speakers sequentially, from the output of an amplifier. These were not very successful due to the high audio power levels involved. An alternative seemed to be to do the switching or whatever at low level and have as may amplifiers as speakers. At first sight this seemed to be a rather expensive way of doing it and there the matter rested.

Just recently, the idea was raised again and while it still seemed rather extravagant to use a number of audio amplifiers, it also still seemed to be a feasible way of approaching the problem. Talks with Editor Jim Rowe and David Edwards resulted in a number of ideas being put forward for trial. After culling out those which did not measure up, the idea of doing the whole circuit along digital lines was investigated at some length.

In short, the basic scanning system proved to be very successful but there were difficult problems associated with using digital techniques for the actual audio modulating process. It could have been done no doubt, but the complexity appeared to be getting out of hand.

As a result, we reverted to the idea of using conventional analog techniques for the modulating process. This explains the "hybrid" arrangement of digital and analog circuitry to achieve our purpose.

Initially, the idea was to use four channels with a 90° modulation shift from one to the next, sequentially, thus giving a similar effect to a rotating speaker. This would be fine but if we could use only three channels with a 120° shift instead, still achieving the wanted result, then the saving would be substantial. Checks showed this to be satisfactory and so this is the method which we have adopted.

Let us look at the circuit to see how it is done. One section of an LM3900 quad amplifier is wired as a two speed oscillator. The square wave output from the oscillator becomes the clock input to a 4022 CMOS IC, which is a divide-by-8 counter/divider with 8 decoded outputs.

The 4022 is wired to divide by 6. Each of the 6 outputs used remains high for one full clock cycle. This means that the driving oscillator must run at a frequency six times the wanted cycle of events from the outputs of the 4022.

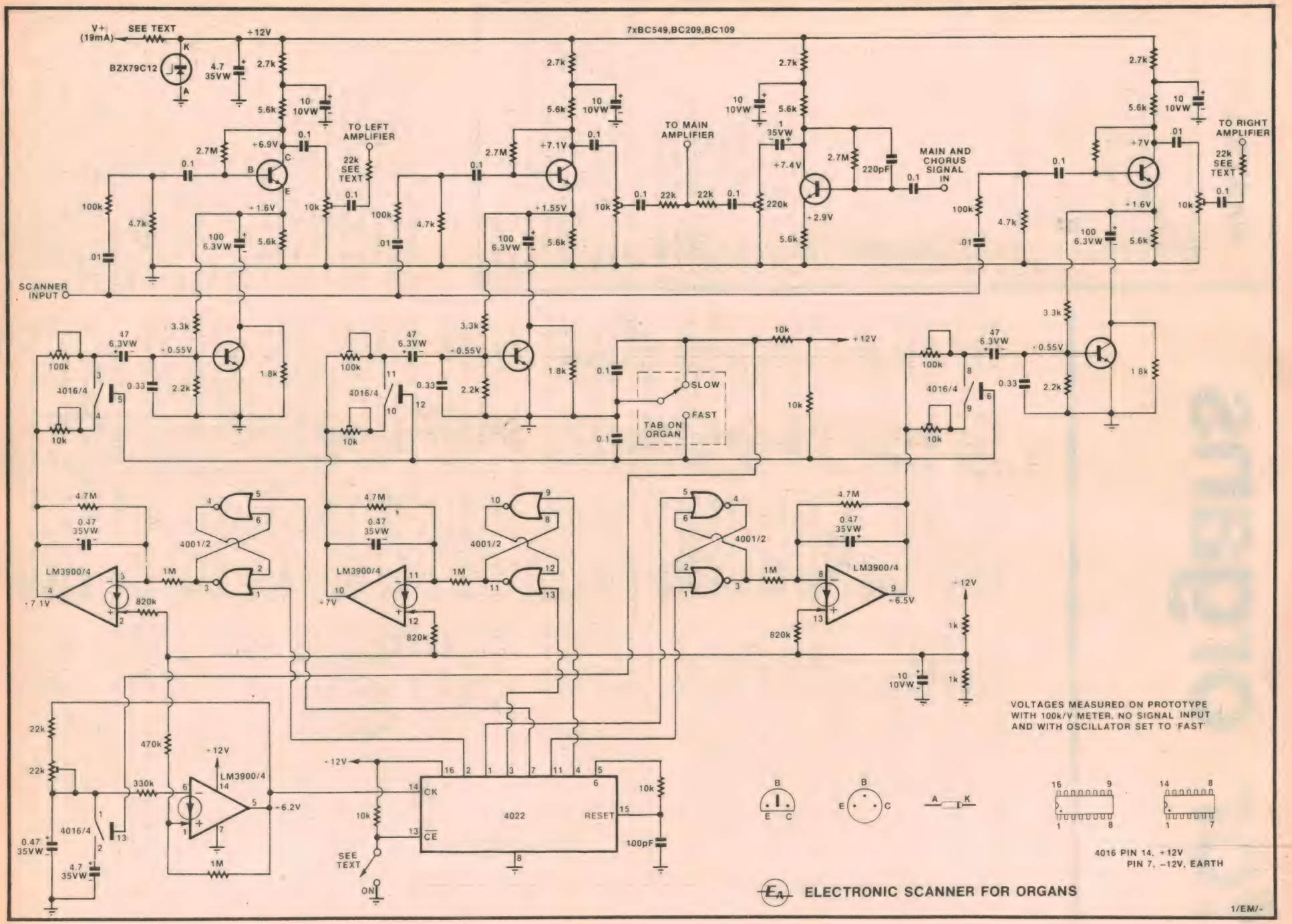
Three R-S flipflops are made up from two 4001 CMOS quadruple 2-input NOR gates. The remaining two gates are left unused. The six outputs of the 4022 are used to toggle the flipflops. Every third 4022 output toggles a particular flipflop and the sequence of events results in the flipflops being triggered at 120° intervals. This gives three square-wave signals with the wanted 120° phase separation.

The square wave output of each of the flipflops drives an integrator which uses the remaining three sections of the 3900 IC. The output from each of the integrators is a triangular wave form, again each one being 120° away from the next one.

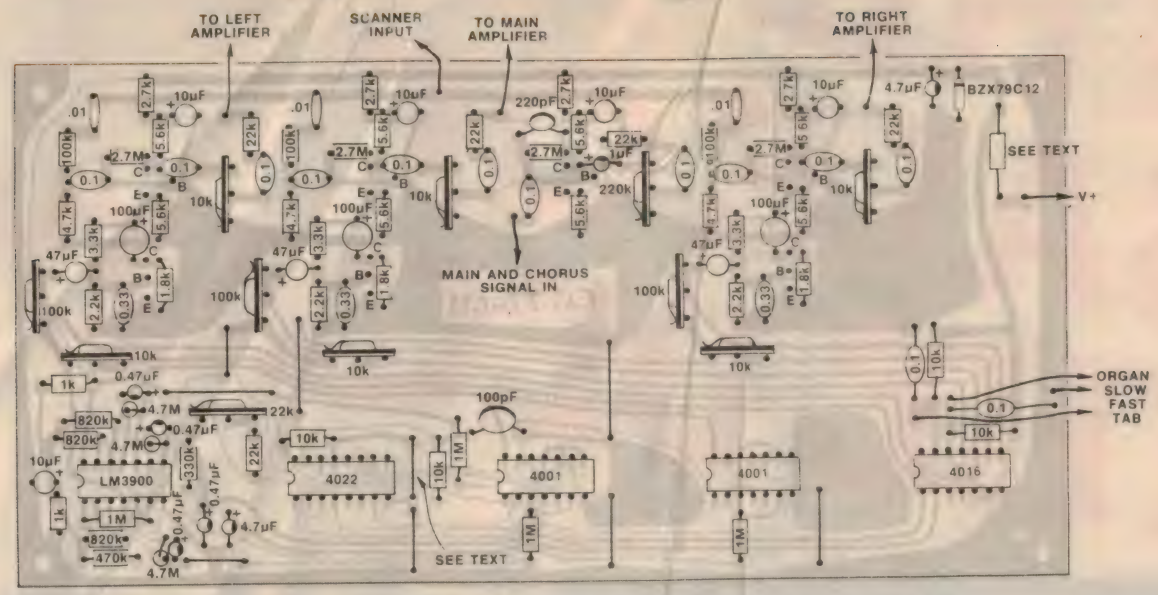
The triangular waves are used to drive three modulator circuits. Although the ideal waveform for this purpose would be a sine wave, the triangular wave approximates a sine wave and does the job quite well. Although it would be possible to filter the triangular wave to a sine wave, we did not find this to be necessary.

The modulation system consists of three modulated amplifiers each of which processes the signal from the organ generators. Bipolar transistors are used here, with a potentially large amount of degeneration in the form of a large value of unbypassed emitter resistor. Modulation is achieved by introducing variable bypassing of the emitter resistor and this is done with another bipolar transistor performing the function of a variable resistor in series with the bypass capacitor.

The triangular waves are used to drive the base of each modulating transistor. The amount of drive for each is controlled by a potentiometer in series with the drive signal. Also, the negative going excursion of the drive is limited by the 1.8k resistor shunting the modulating transistor. This avoids cutting off the modulated amplifier in the event of excessive drive.


7xBC549,BC209,BC109
V+ (19mA)
SEE TEXT
BZX79C12
+12V
TO LEFT AMPLIFIER
TO MAIN AMPLIFIER
MAIN AND CHORUS SIGNAL IN
TO RIGHT AMPLIFIER
SCANNER INPUT
SLOW
FAST
TAB ON ORGAN
4016/4
4001/2
LM3900/4
4022
CK
RESET
CE
SEE TEXT
ON
VOLTAGES MEASURED ON PROTOTYPE WITH 100k/V METER, NO SIGNAL INPUT AND WITH OSCILLATOR SET TO 'FAST'
4016 PIN 14, +12V
PIN 7, –12V, EARTH
ELECTRONIC SCANNER FOR ORGANS
1/EM/-

Electronic scanner for organs



Component overlay diagram for the PC board. The CMOS ICs should be fitted last.

The higher speed is made variable by means of a 22k trimpot in the oscillator circuit. The low speed is achieved by switching in an extra capacitor across the existing one in the oscillator. The low speed is not made separately variable, as it is generally accepted that small changes are not necessary.

Speed switching is done by means of a type 4016 CMOS quad bilateral switch. One section of this switch is used to switch the capacitor in the oscillator. The three remaining sections are used to switch in trimpots to control the amount of drive to the modulators. In turn, the switches may be controlled by the tab normally used for this purpose on the console of the organ. If such a tab is not available, then a single pole changeover switch will serve for this function.

An extra stage, also using a bipolar transistor has been provided. Its main purpose is to provide phase inversion for the "main" and "chorus" signals, to balance the inversion of the signals passed through the scanner stages. Also, the outputs of the scanner and phase inverter are brought together via two 22k isolating resistors.

Provision has been made to stop the scanner action if this is desired. A switch appears on the circuit diagram at pin 13 of the 4022 IC. This is replaced with a link on the board if the facility is not wanted.

Facing page: 5 integrated circuits and 6 transistors are used in the circuit of the new scanner.

Power requirement for the complete unit is quite modest, being 12V at about 19mA. A 12V zener diode has been provided on the board, with a place for a series dropping resistor. The value of the resistor will have to be calculated to meet individual requirements. In addition to the 19mA or so taken by the unit, an extra 5mA or so should be allowed for the zener diode. A round figure of 25mA could be assumed.

So much for the circuit and a broad outline as to how it works. Use of the device will depend upon the requirements of the individual and the particular organ with which it is to be used.

Basically, a signal which is not intended to be passed through the scanner will be fed into the "main & chorus signal in", via the phase inverter and then into the main amplifier. Signals which are to be processed by the scanner will be fed to the "scanner input", which is then fed in parallel into the three modulated amplifiers, the outputs being affected by the fast or slow scanning accordingly. Each of the three outputs from the scanner must be fed into a separate amplifier, although one of these may normally be the main amplifier.

The scanner circuit is intended to be fitted into the signal lines immediately before it is fed into the audio amplifiers. Although the various stages in the scanner circuitry have some gain, preset potentiometers are provided so that the net gain can be adjusted to about unity.

It will be necessary for each installation to be treated individually, as there are many variations on the way the signals are routed, according to the ideas of the manufacturers. As a basic rule, all percussion effects will be fed via the main amplifier path, avoiding any vibrato or scanning. Some organs provide for a separation of the voices, only allowing tibias or flutes through the rotating speaker. On the other hand, many makers direct all voices, except percussions, through the rotating speaker. Obviously, this is one for you to sort out for yourself.

The complete circuit, except for power supply which may be obtained from a suitable point on the organ itself, is contained on one printed circuit board. The size, 204mm x 101mm, has been kept to a minimum so that it may be fitted into the organ with a minimum of space problems. Construction is reasonably straightforward and anyone familiar with building equipment on PCBs should be able to build it up successfully.

Apart from the circuit diagram, there is also a layout diagram which should make the job quite easy as far as component location is concerned. The usual precautions should be taken when soldering, not to overheat vital components, consistent with care to make sure that there are no dry joints. Polarities of components, such as electrolytic capacitors, transistors and diodes should be carefully observed.

It is generally good practice to mount the smallest components first, such as resistors, followed progressively with the larger components. There are nine

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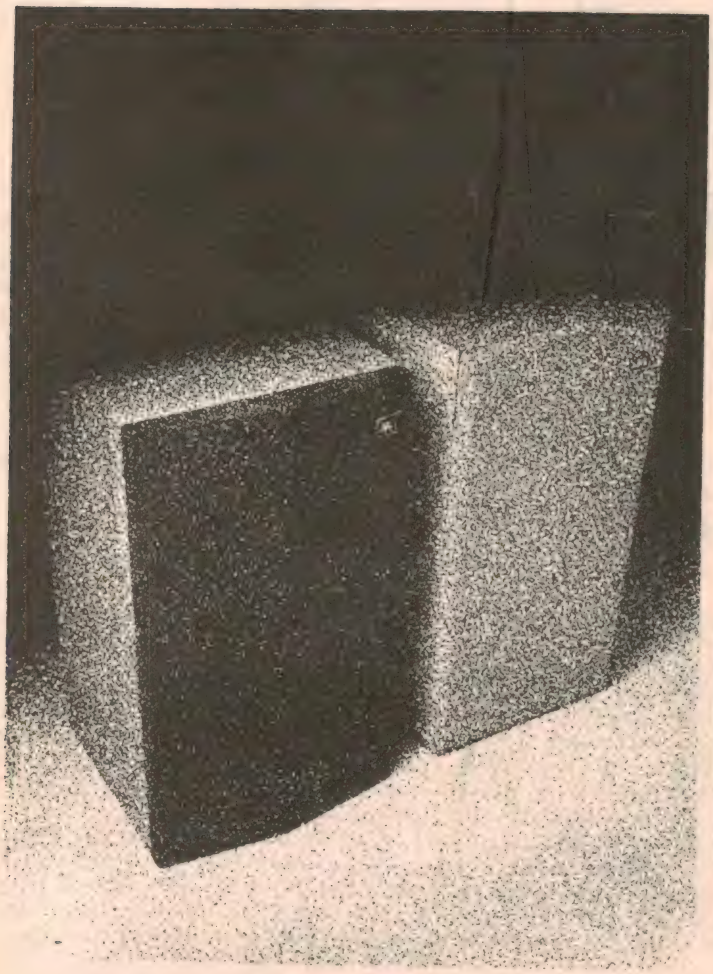

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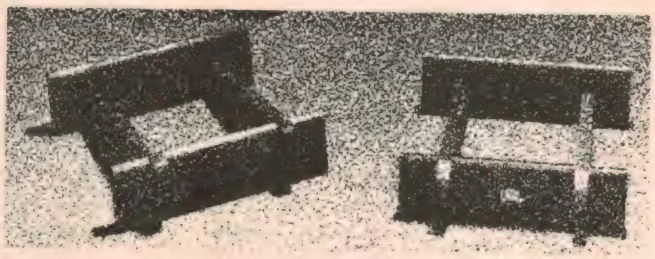

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links on the board and these should be fitted at the same time as the resistors. If you wish to use the on/off scan switching, then the appropriate link will be omitted and arrangements made for wiring in a suitable switch.

The last items to be fitted will be the five ICs. Apart from the LM3900, the rest are CMOS devices and care must be taken when fitting them. Leave each IC in its protective package until it is to be fitted. Then the soldering iron should have a clip lead from its barrel and in turn, clipped to the earth copper on the board. In addition to this electrical precaution, it will be noted that the spaces between pin connections on the ICs are very close. Considerable care must be taken when soldering, using a small iron bit, to ensure that no adjacent points are bridged with solder.

Having finished the board assembly, there will be still one resistor missing. This is the dropping resistor between the external supply voltage and the 12V zener diode. The unit is designed to operate from a 12V supply at a current of about 19-20mA. If you have a 12V supply available, then the dropping resistor and zener diode will not be needed and the supply may be fed in at the +12V zener diode point.

Most of us will not be fortunate enough to have a 12V supply available. One possible source which may be used is the supply to the main power amplifier. If it is a single supply, the voltage may be between 48 and 60V. If the supply is a balanced one, then there may be plus and minus 24 to 30V. The positive supply must be used.

Having determined the actual positive supply voltage, we then have to calculate the value of the dropping resistor. Assuming a current drain of 20mA and allowing an extra 5mA for the zener diode, we have a total current of 25mA. As an example, suppose that we have a 60V amplifier supply which we can draw on. The voltage drop across the resistor will be 60V-12V, which equals 48V. By Ohm's law, the resistor will be 48/.025, which comes to 1920 ohms. The nearest preferred value is 1.8k, the result being that there will be somewhat more than 5mA flowing through the zener diode — but it will be still well within the dissipation rating.

Now the dissipation of the 1.8k resistor must be considered. With a voltage drop of 48V, the power dissipation will be $48^2/1800$, which comes to 1.28W. A 2W resistor would do, but it would not be conservative enough for long periods of use and so a 5W resistor would be the wise choice.

If you are fortunate enough to have available a CRO and an audio generator, you may make preliminary checks and adjustments to the scanner before it is fitted into the organ. By doing this, it will become clearer as to how the device works.

To make the preliminary checks, proceed as follows. Set all trimpots to mid-position, except the 10k and 220k units feeding the main amplifier via the 22k resistors. Set the latter two trimpots to full level. Apply power to the unit via the calculated dropping resistor. Check that the voltage across the zener diode is 12V and that the zener diode and the dropping resistor are showing no signs of distress. Other voltages may be checked and compared with those marked on the circuit, as read from the prototype. Your voltages should be close to those on the circuit.

Set the audio generator to about 400Hz and at an output level between about 200 and 500mV RMS and feed it into the "main & chorus signal in". Check the output "to main amplifier" on the CRO and a clean signal should be observed. Now connect the generator to the "scanner input". With the CRO still on the same output point and with the modulation set to "fast", the modulation envelope should be observed. If necessary, adjust the timebase so that the envelope can be viewed properly. The envelope will be triangular rather than sinusoidal in shape.

At this point, a preliminary adjustment of the modulation depth may be made on this channel. Adjust the 10k trimpot in the base circuit of the modulating transistor for this channel. It will not be possible to drive the stage sufficiently to cause cutoff of modulation, due to the limiting effect of the 1.8k shunting resistor. However, a "flattening" of the negative excursion of modulation will be observed when too much drive is applied. The correct adjustment is just before the onset of flattening. Note the minimum level on the CRO.

Now switch to "slow" and adjust the corresponding 100k trimpot for the same minimum level as previously observed for the fast condition. Return to the fast position and retouch the 10k trimpot to give the same condition as previously. The right and left channels may be adjusted in the same way as just outlined.

In cases where a CRO and an audio generator are not available, the unit may be set up quite satisfactorily by audible means. A little more time and care may be needed but after all, it is the ear which must be satisfied!

The scanner board will have to be connected into the organ signal lines to be adjusted audibly. Obviously, it will

also need to be connected up after it has been tested with a CRO and audio generator. In either event, consideration should be given to the location of the board. This may be dictated by available space and shortness of signal leads. If the leads can be kept short, say 10 to 15cm or so, then with the rather high signal levels usually available, shielding of the signal leads may not be necessary. On the other hand, with much longer leads, it would be wise to run them in shielded cable.

With the board in place and connected up, before making adjustments, turn the four output potentiometers (three 10k and one 220k) right down. A situation should be simulated where the maximum sound level is likely to be demanded of the organ. This means something like "all stops out", with say the bottom C pedal and a chord played by each hand. Under these conditions, and with other tabs set so that the scanner is not in use, bring up the 220k potentiometer until the volume is as loud as you are likely to require, or just before distortion occurs. This will be the setting against which the scanner levels will be set.

The following adjustments can be a little tricky but as I mentioned before, the ear is the final judge. Earlier, I suggested that all preset potentiometers, except those controlling output levels, be set to mid-position. Now set the scanner to "slow". With the "main" channel volume as the reference, advance the 10k potentiometer which feeds the "main" amplifier and set the volume a little lower than the reference. At this point, a multimeter with a low AC volts range would be useful.

Check the voltage across the voice coil of the appropriate speaker and note the reading. Because of the scanning effect, the voltage will waver between two values. Set the right and left trimpots, with the meter across the respective voice coils, to give the same range of readings. If you do not have a meter available, then an audible estimation of the levels will have to be made.

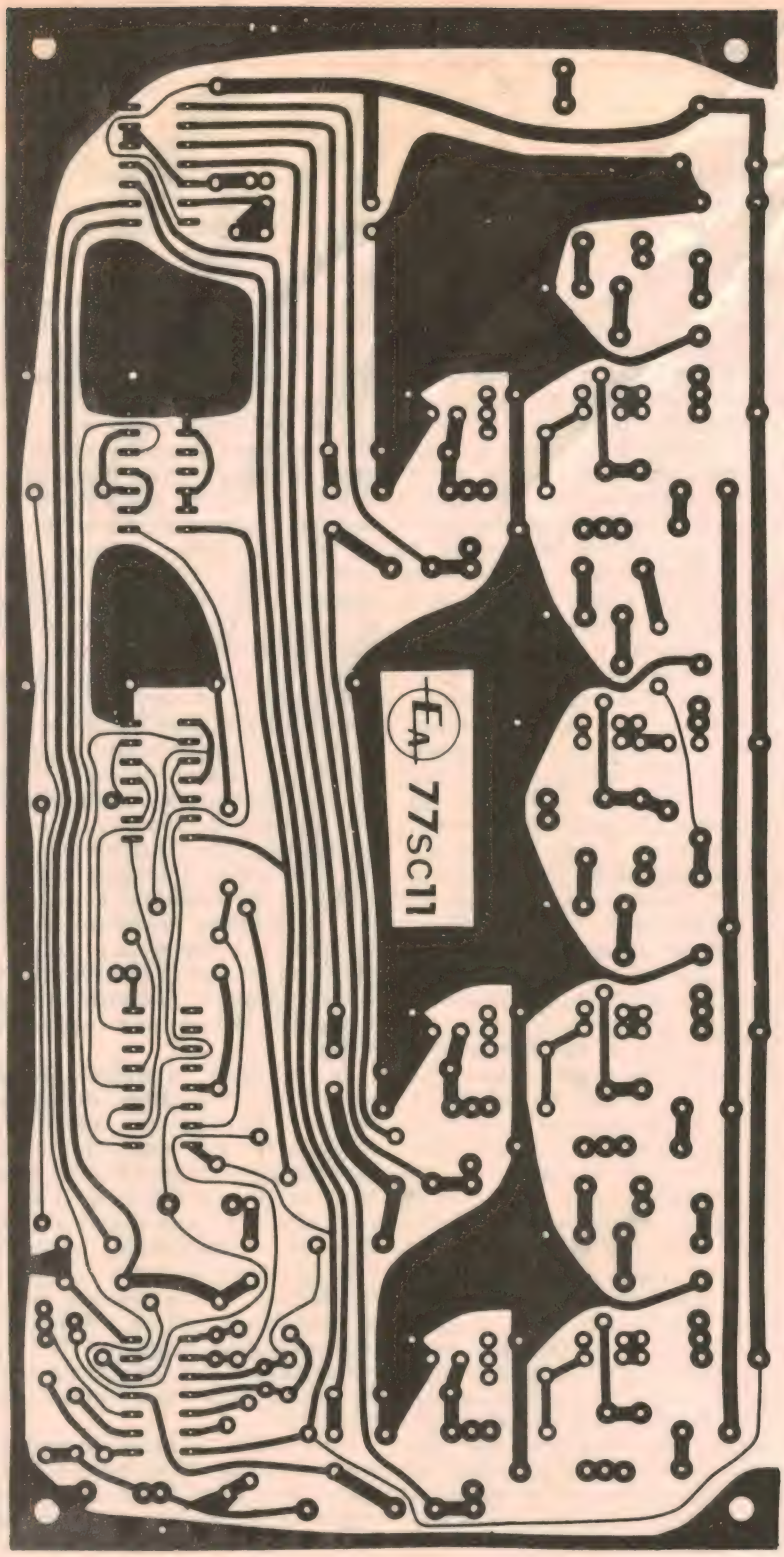
With the levels now set to equal values, the overall sound level of the slow scan output should be about equal to the "main" or reference output. If necessary, an adjustment slightly higher or lower may need to be made on all three output levels.

At this point, you may wish to vary the depth of the slow scan modulation. This can be done by adjusting the three 100k trimpots controlling the drive to the modulator stages.

Now switch to "fast" scan. The volume levels should not need any adjustment, but you may wish to alter the depth of the modulation. To get the maximum effect, the three 10k trimpots for adjusting the modulation depth should be advanced as far as possible, consistent with a tolerable level of "pumping" from the three speakers when no signal is being passed. However, you may settle for a modulation depth which falls short of any audible pumping of the speakers.

The actual speed of the fast scan should be fairly close with the 22k trimpot set to its mid-position. However, it may now be adjusted to the speed which suits you best. This normally comes to somewhere between about 400 and 420 beats per minute.

The foregoing description of the adjustment and application for the scanner should be sufficient to get it going satisfactorily. No attempt has been made to treat the theme fully, as the variations in application and personal taste are so diverse as to make this impossible.



Actual size reproduction of the PC pattern.

Where to buy printed boards etc

One of the most frequent requests we receive from readers concerns the availability of printed circuit boards for our projects. To a lesser degree they also enquire about chassis and etched panels.

Some readers imagine that we manufacture and distribute boards. Others appear to believe that these are available only from special sources. We do not manufacture or distribute any of these items, or any other components. But we are concerned that our readers should be able to buy these parts with no more difficulty than the other components used in a project. When a project is ready for publication we distribute drawings of printed boards, chassis, and front panels to a number of manufacturers who have requested this information.

These manufacturers are then in a position to supply these items to any distributor who requires them or, in some cases, direct to the public. On this basis you should be able to obtain these items from the same distributor who supplies your resistors, capacitors, transistors and other routine components. If he does not have them in stock he should have no difficulty obtaining them to order.

However, for the benefit of those readers who may have difficulty in obtaining these items, for one reason or another, we list below those manufacturers who are currently on our mailing list. If all else fails they should be able to either supply you direct, or advise which distributors are holding stocks.

PRINTED BOARDS

Applied Technology Pty Ltd
109 Hunter Street,
Hornsby, NSW 2077

Bespoke Metalwork
42c Sydenham Road,
Brookvale, NSW 2100

BKX Electronic Supply Service
PO Box 787,
Potts Point, NSW 2011

"Cirprint"
PO Box 165,
Bentley, WA 6102

David J. Reid NZ Ltd
PO Box 2630,
Auckland, NZ

E. H. Earl Ltd
PO Box 834,
Wellington, NZ

Jemal Products
120 Briggs Street,
Welshpool, WA 6106

Mini Tech Manufacturing Co. Ltd
PO Box 9194,
Newmarket, NZ

Neosonic Electronics
PO Box 50,
North Strathpine, Qld 4500

Printed Circuits Ltd
PO Box 4248,
Christchurch, NZ

RCS Radio Pty Ltd
651 Forest Road,
Bexley, NSW 2207

Statronics Pty Ltd
103 Hunter Street,
Hornsby, NSW 2077

CHASSIS

Bespoke Metalwork
42c Sydenham Road,
Brookvale, NSW 2100

Coin Selectors Pty Ltd
PO Box 203,
Narrabeen, NSW 2101

Cowper Sheetmetal & Engineering
11 Cowper Street,
Granville, NSW 2142

ETCHED PANELS

Bespoke Metalwork
42c Sydenham Road,
Brookvale, NSW 2100

Cowper Sheetmetal & Engineering
11 Cowper Street,
Granville, NSW 2142

Jemal Products
120 Briggs Street,
Welshpool, WA 6106

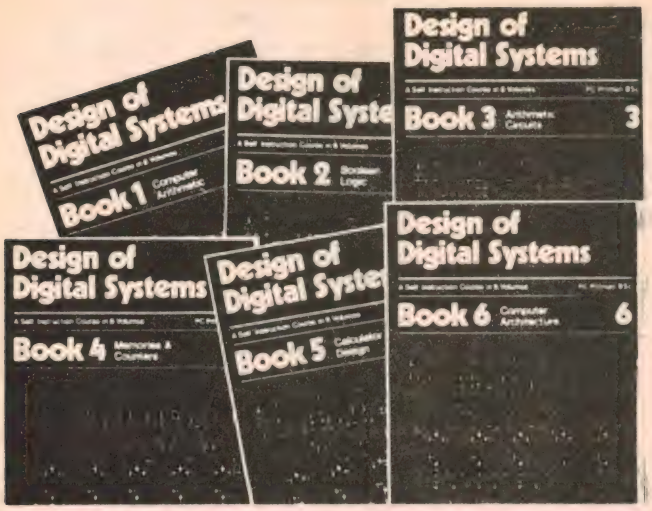
As a spin-off from the drawings we prepare for the trade, we can also supply copies for our readers (price $2.00). Those with access to metal working or etching facilities can take advantage of this to "roll their own".

However, beginners should be aware that this may not always be the most economical approach. To the cost of drawings must be added the cost of raw materials, wastage, etc, plus the disappointment which comes from a job which may fall short of professional standards.

As a general rule it costs very little more to buy the ready made product, saves a lot of time, and results in a much more satisfying end result.

Understanding Digital Electronics

New teach-yourself courses



Design of Digital Systems is written for the engineer seeking to learn more about digital electronics. Its six volumes — each 11-1/2" x 8-1/4" are packed with information, diagrams and questions designed to lead you step-by-step through number systems and Boolean algebra to memories, counters and simple arithmetic circuits, and finally to a complete understanding of the design and operation of calculators and computers.

The contents of Design of Digital Systems include:

Book 1 Octal, hexadecimal and binary number systems; conversion between number systems; representation of negative numbers; complementary systems; binary multiplication and division.
Book 2 OR and AND functions; logic gates; NOT, exclusive-OR, NAND, NOR and exclusive-NOR functions; multiple input gates; truth tables; De Morgans Laws; canonical forms; logic conventions; Karnaugh mapping; three-state and wired logic.
Book 3 Half adders and full adders; subtractors; serial and parallel adders; processors and arithmetic logic units (ALUs); multiplication and division systems.
Book 4 Flip flops; shift registers; asynchronous and synchronous counters; ring, Johnson and exclusive-OR feedback counters; random access memories (RAMs) and read only memories (ROMs).
Book 5 Structure of calculators; keyboard encoding; decoding display data; register systems; control unit; program ROM; address decoding; instruction sets; instruction decoding; control program structure.
Book 6 Central processing unit (CPU); memory organization; character representation; program storage; address modes; input/output systems; program interrupts; interrupt priorities; programming; assemblers; computers; executive programs; operating systems and time sharing.

Digital Computer Logic and Electronics is designed for the beginner. No mathematical knowledge other than simple arithmetic is assumed, though the student should have an aptitude for logical thought. It consists of four volumes — each 11-1/2" x 8-1/4" — and serves as an introduction to the subject of digital electronics. Everyone can learn from it — designer, executive, scientist, student, engineer.

Contents include: Binary, octal and decimal number systems; conversion between number systems; AND, OR, NOR and NAND gates and inverters; Boolean algebra and truth tables; De Morgans Laws; design of logic circuits using NOR gates; R-S and J-K flip flops; binary counters, shift registers and half adders.

In the years ahead the products of digital electronics technology will play an important part in your life. Calculators and digital watches are already commonplace. Tomorrow a digital display could show your automobile speed and gas consumption; you could be calling people by entering their name into a telephone which would automatically look up their number and dial it for you.

These courses were written by experts in electronics and learning systems so that you could teach yourself the theory and application of digital logic. Learning by self-instruction has the advantages of being faster and more thorough than classroom learning. You work at your own pace and must respond by answering questions on each new piece of information before proceeding.

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Letters to the editor

Loudspeaker review

Thank you for your magazine's very fair review of the JBL 4301 Broadcast Monitors (EA, September 1977, p.35).

We find it absolutely necessary to correct some wrong inferences drawn in the conclusion of the article, however. The author commenced the article by choosing to evaluate the 4301s as he would a pair of hifi speakers, and this is, of course, very valid. The conclusion of the review, however, gives the impression that JBL describes the 4301 as a "Broadcast Monitor" as some sort of gimmick to induce the public to hold them in a higher esteem than is their due, and buy for this reason.

Perhaps this criticism is rightly founded, in view of the well known tendency for the term "monitor loudspeaker" to be rather loosely hung on quite a few devices that would never be seriously considered for professional monitoring.

The 4301s were submitted as Broadcast Monitors for the primary interest of your readers in the broadcasting industry, however. JBL introduced the model 4301 at the Audio Engineering Society Exhibition in Los Angeles in May this year. The 4301s are not offered for sale to the hi-fi dealerships. JBL has a very strict policy on this point, and professional series transducers are distributed through a separate dealer network to hifi products.

At this time there are over 1600 JBL monitors used professionally in Australia. The ABC has approximately 300, alone. The price and size of the JBL Monitor Systems exclude them from most living rooms, and there is a waiting period on most of the seven models. However, in recognition of the growing number of home recording studio enthusiasts, we market JBL Professional Monitor Systems through three hifi dealers. ENCEL ELECTRONICS, Melbourne, CONVOY TECHNOCENTRE, Sydney and PACIFIC STEREO, Manuka, ACT, subject to availability.

All is not lost, however. JBL will introduce a "domesticated" 4301, the L19, early next year in the European market. The L19 will arrive in the JBL specialist dealerships during February or March, 1978, right around Australia.

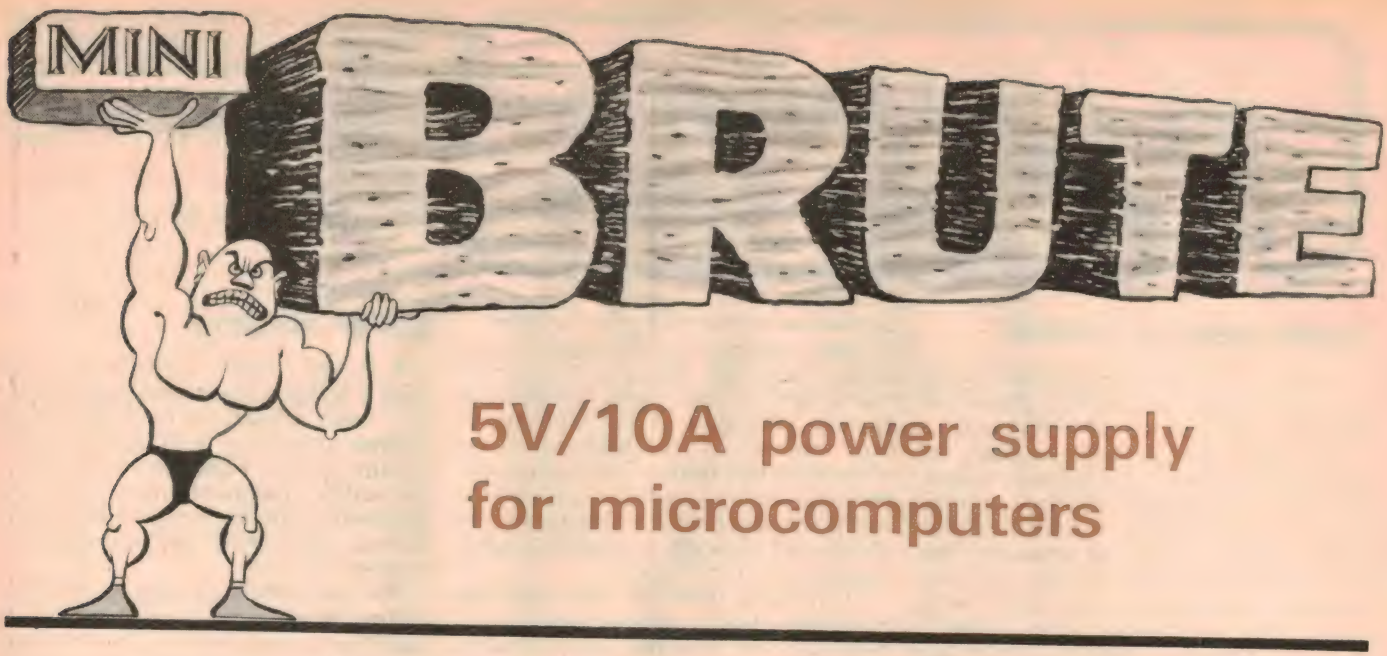
Trevan C. Johns
Sales Manager,
Harman Australia Pty Ltd.

Laser surgery

It is with some interest that I read your leading article in the August issue on "Laser Surgery in Australia". I am writing to enter a mild protest at the failure of your reporter to include in the article reasonable mention of the pioneering use of the laser in surgery in New South Wales by the surgeons at Sydney Hospital.

The surgical Laser was installed at Sydney Hospital six months prior to installation at the Children's Hospital and at least 10 times more surgery has been performed at Sydney Hospital than at the Children's Hospital. A far wider variety of operations has also been performed at Sydney Hospital. It might have been expected that the pioneering experience obtained by the surgeons at Sydney Hospital would be the basis for an article on laser surgery in your magazine.

W. H. McCarthy, FRACS, M.Ed.,
Associate Professor of Surgery,
Sydney Hospital.



5V/10A power supply for microcomputers

Intended for the heavy current drain of a microcomputer with expanded memory and peripheral interfacing, this little "brute-force" supply is much simpler in approach than the elegant switch-mode designs but provides a highly regulated five volts at up to 10 amps. It uses readily available components, is short circuit proof and has optional crowbar protection.

by LEO SIMPSON

Anyone who becomes involved with hobby computing quickly discovers that there is an apparently universal tendency for hobby computer systems to "grow". They might start as baby systems, but before long you are adding extra memory, interfacing circuitry for this peripheral or that, some more memory, and so on.

And with this growth, the power drain inevitably goes up. Even though the drain is really very low compared with early computers, thanks to the MOS technology used to make modern microprocessors and memories, it soon rises to a point where one's small original power supply becomes embarrassed.

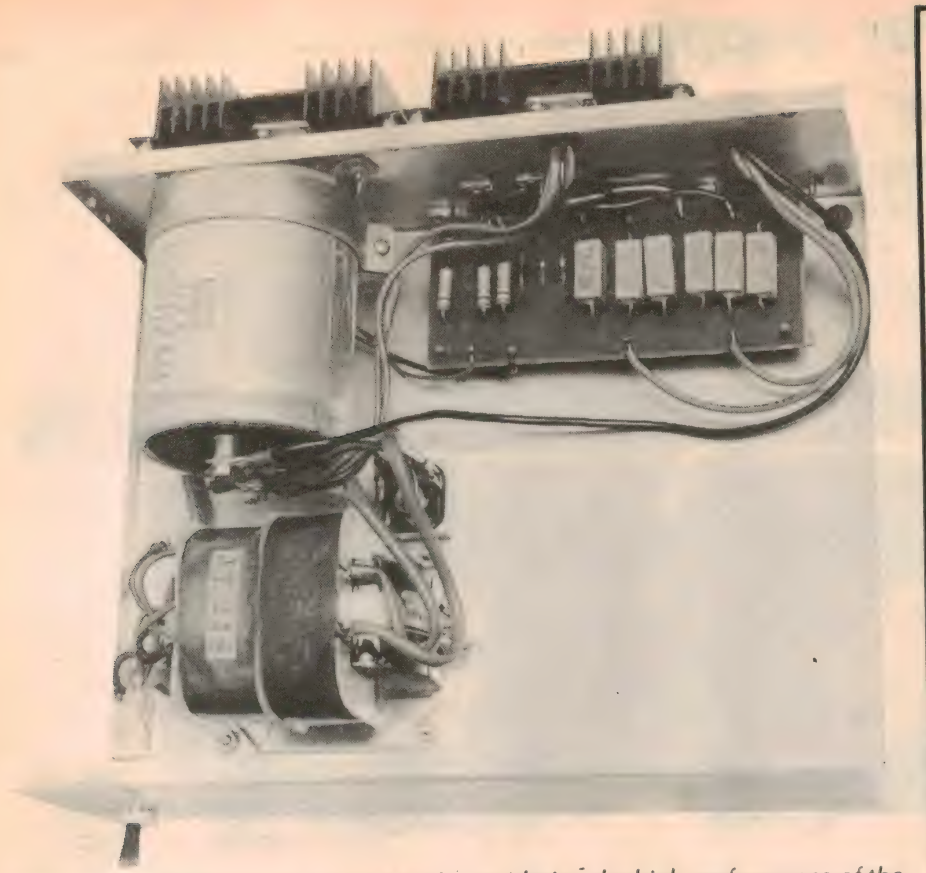
Generally most of the current drain is associated with the +5 volt power supply. So to help computer hobbyists cope with their expanding systems, we have decided to produce this heavy-duty 5V supply. It will deliver a nominal 10 amps, which should satisfy the likely current demands of most hobby systems — at least for a while!

A major problem to be faced in the design of a high current supply is that of efficiency and the inversely related parameter, heat dissipation. For this reason, many commercially designed regulated power supplies these days tend to be the "switch-mode" type, most commonly seen in colour television receivers.

Switch-mode power supplies are very efficient and have relatively low power dissipation and low mass. Offsetting these advantages are complicated circuits which can be less reliable than conventional regulated power supplies. Recently, there have been some quite simple and elegant designs based on IC regulators driving switching transistors. While this approach is attractive, it is not very practical as far as the hobbyist in Australia is concerned. High-current high-speed switching transistors and their accompanying high current fast recovery diodes are almost as rare as rocking-horse manure, and correspondingly expensive. A special inductor is also required. Reluctantly, then, we had to admit that some other approach was required.

We also considered the concept of a Triac based regulator circuit in the primary of a power transformer, with feedback from the low voltage output to the Triac control circuitry. This would have the advantage of reasonable efficiency, but the gloss

Not pretty, as befits a brute. The cover is raised to aid ventilation.



Relatively few components are involved, considering the high performance of the supply. The blank area can be used for our cassette interface board.

PARTS LIST

1 aluminium case, 18 SWG, 285 x 230 x 90mm
1 PC board, 140 x 60mm, coded 77ps11
1 transformer with secondary 11V at 10A DC
1 SPST mains toggle switch
1 12-way insulated terminal strip
2 double-sided heatsinks, 102 x 75mm

SEMICONDUCTORS
1 LM340T-5 or uA7805 5V IC regulator
1 TIP32 PNP transistor
2 2N3055 NPN transistors
1 1N4001 silicon 1 amp diode
1 1N5408 or equivalent 3 amp silicon diode
1 PB40 or equivalent 25 amp bridge rectifier

RESISTORS
3 x 100 ohms/½W, 3 x 1 ohm/1W
6 x 0.56 ohm/5W

CAPACITORS
1 33000uF at 16V or more, or
3 5600uF/40V (see text)
1 x 4.7uF/35VW tantalum electrolytic

MISCELLANEOUS
4 rubber feet, 4 PCB supports (Richco), 8 6mm metal spacers, 2 grommets, 2 TO-3 sockets, mounting hardware for TO-3 transistors, heatsink compound, 6 Utilux quick-connectors, 7 crimp spade lugs plus crimping tool, mains cord and three-pin plug, mains cord clamp, solder lug, 4mm auto cable, screws, nuts, lockwashers, solder.

went off the idea when calculations indicated the large amount of filter capacitance required to achieve low ripple on the output. Half a dozen computer-grade electrolytic capacitors would make a sizable debit in most hobbyist's bank accounts!

Eventually, we decided upon the circuit featured here. It uses the old "tried and proven" series regulator in a souped-up circuit. The circuit is not original, but is based on an Application Note in the National Semiconductor "Voltage Regulator Handbook".

This supply has the advantage of using components which are readily available in Australia, and an overall cost which is quite reasonable considering the performance. There is but one disadvantage — heat dissipation. When supplying that highly regulated five volts at 10 amps (50 watts) the circuit dissipates between 60 and 70 watts. As a result, it gets stinking hot!

But before you toss this magazine aside, read a little further. Lest we paint too bad a picture, let us assure you that the component ratings are not exceeded. This can be hard for many people to accept. After all, everyone knows that valves are supposed to get hot, but transistors are supposed to stay cucumber cool. Well that need not be so; in fact they can run very hot indeed, and quite reliably.

Refer now to the circuit diagram. Basically, it is a current sharing arrangement with a three-terminal 5V IC regulator providing about 10% of the current and the other 90% being provided by Tr2 and Tr3.

The front half of the circuit is quite conventional, with the low voltage transformer secondary being rectified by a silicon bridge rectifier to feed a big fat electrolytic capacitor which provides about 10 to 12 volts DC. From there, the DC is split into three paths. Assuming a 10 amp load, about 1 amp goes to the 5V IC regulator via a diode and two 1 ohm/1W resistors in parallel. About 0.5 amp goes to Tr1 via the 1 ohm/1W resistor, and about 8.5 amps goes to the collectors of Tr2 and Tr3.

The current sharing mechanism works as follows. The current drawn by the IC regulator produces a voltage drop in the 0.5-ohm resistance produced by the two 1 ohm resistors in parallel. This forward biases Tr1, which by emitter follower action draws enough current to balance the drop across the 0.5-ohm resistance with that across its 1-ohm emitter resistance. The diode is used to balance out the base-emitter voltage of the transistor.

Tr1 then supplies base current to Tr2 and Tr3. The current gain of Tr2 and Tr3 then determines how much of the total current they supply to the load. In most cases, Tr2 and Tr3 will supply adequate current to the load so that the IC is handling less than 1 amp when the total load current is 10 amps. In a few cases it may be necessary to shunt the 1 ohm feed resistor to Tr1 to increase the current drive to Tr2 and Tr3.

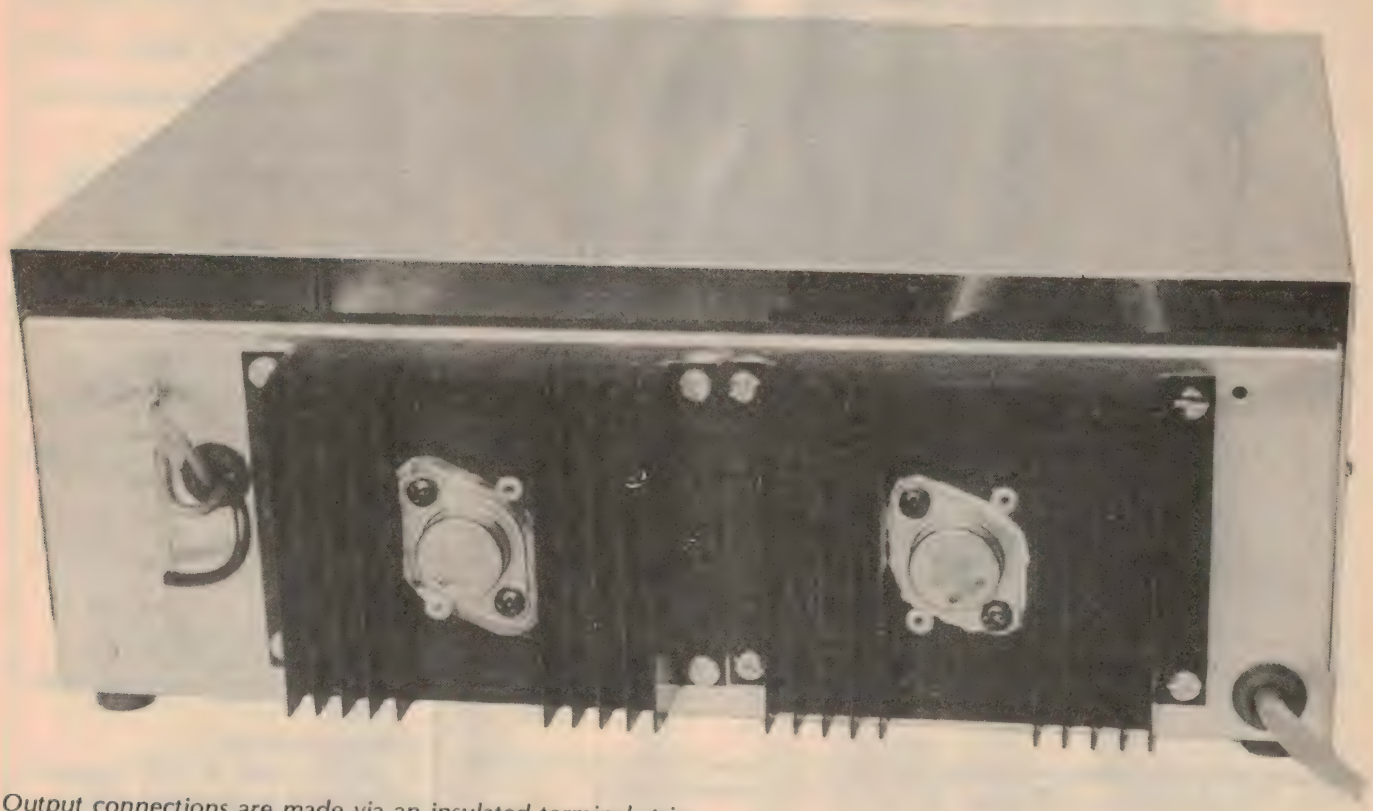
The emitter resistors of Tr2 and Tr3 ensure that they each supply approximately the same current, to share the load.

The current sharing mechanism described above makes it possible for the IC regulator to closely control the voltage applied to the load, at currents far above its normal rating. If the voltage across the load tends to rise above the nominal 5V output of the regulator, the regulator tends to shut down slightly and, via the current sharing mechanism, shuts down Tr2 and Tr3 by the appropriate amount.

Similarly, if the voltage applied to the load tends to drop below the nominal 5V, the regulator tends to draw a little more current to make up the difference, and Tr2 and Tr3 are driven just a little harder to do their share.

Just how effective is this system of

5V/10A power supply



Output connections are made via an insulated terminal strip.

voltage regulation? With our prototype, the change in output voltage from no load to full load (10 amps) is only 8 millivolts. Hum and noise on the output are less than 2 millivolts peak-to-peak at full load. Line regulation, with mains voltage changing from 264V to 216V, is less than 3 millivolts. These figures are more than adequate for the job.

There are three 100 ohm resistors in the circuit to ensure that the IC regulator maintains full control right down to zero load current. The 100 ohm resistors across the base-emitter junctions of the transistors ensure that they do not turn on harder than required, while the 100 ohm resistor across the output ensures a 50 milliamp output current whether or not an external load is connected.

A 4.7uF tantalum capacitor is connected across the input to the IC regulator to ensure stability. Capacitors are not required across the output for stability, although they can be added to improve transient response. In any case, it can be assumed that most circuitry with which this power supply will be used will have supply bypass capacitors.

By virtue of the IC regulator and the current sharing mechanism already referred to, the power supply is protected against short circuits. The IC has two protection mechanisms, "safe operating area" and thermal limiting. The first limits the current to control the power dissipation, while thermal limiting monitors the chip temperature and shuts down the output to prevent overheating.

This system of protection is effective only for short term overloads. Long term overloads will damage not only the regulator circuit but also the bridge rectifier and transformer. If this possibility is likely a 15 amp fuse should be connected in series with the regulator circuitry. More about protection later in this article.

Three of these 5600uF/40VW electrolytics from Elna can provide the main filter capacitance for the power supply. Each has a ripple rating of 4.3 amps.

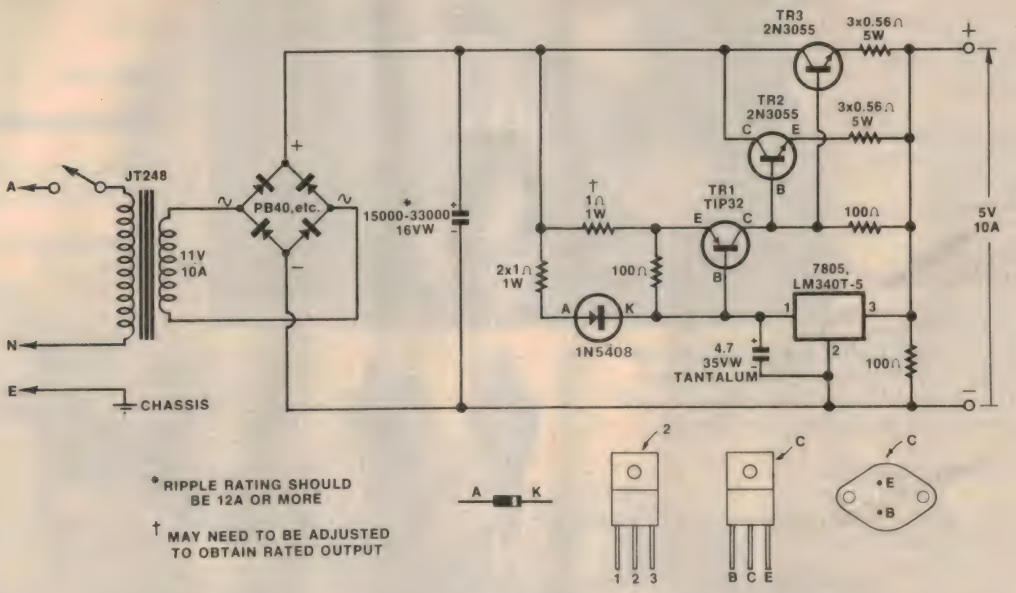
Our prototype was assembled into an aluminium case with dimensions 285 x 230 x 90 mm. This case is almost identical to that for the Miniscamp project described in May 1977, and was kindly supplied by Bespoke Metalwork.

The power transformer was made by Jones Transformers and is designated JT-248. It is based on the same hardware as the C-core transformer used in the Playmaster Forty-Forty. As such, the C-core enables a modest overall size with very good inherent regulation.

An EDI Minibridge, type PB40, was employed as the bridge rectifier. It has a rating of 25 amps continuous, which is necessary if it is to withstand short circuit conditions.

We used a 33000uF computer-grade electrolytic for the main filter capacitor. However, depending on your usual sources of supply, computer grade electrolytics may be expensive and may be hard to get. Some constructors will be able to salvage capacitors from old computer gear.

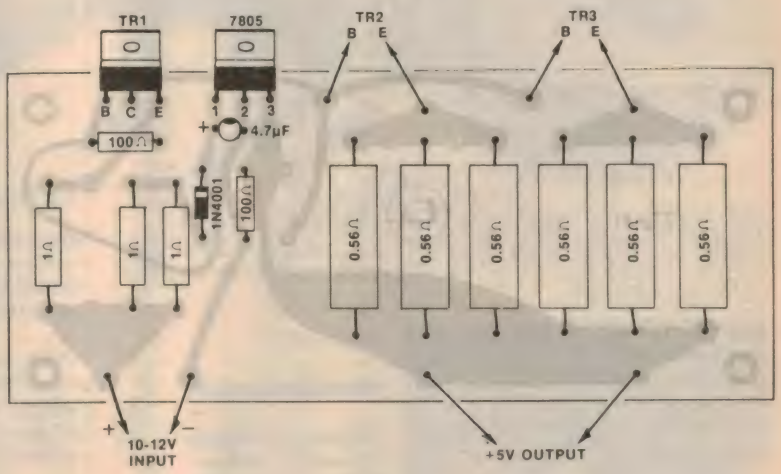
For those without these resources, there is an alternative in a new capacitor from Elna, distributed by Soanar Electronics Pty Ltd. It is a PCB mounting type with value of 5600uF/40VW and ripple rating of 4.3 amps. Three of these capacitors con-



5V/10A MICROCOMPUTER POWER SUPPLY

2/PS/-

Most of the smaller components are mounted on the PCB which simplifies the wiring.



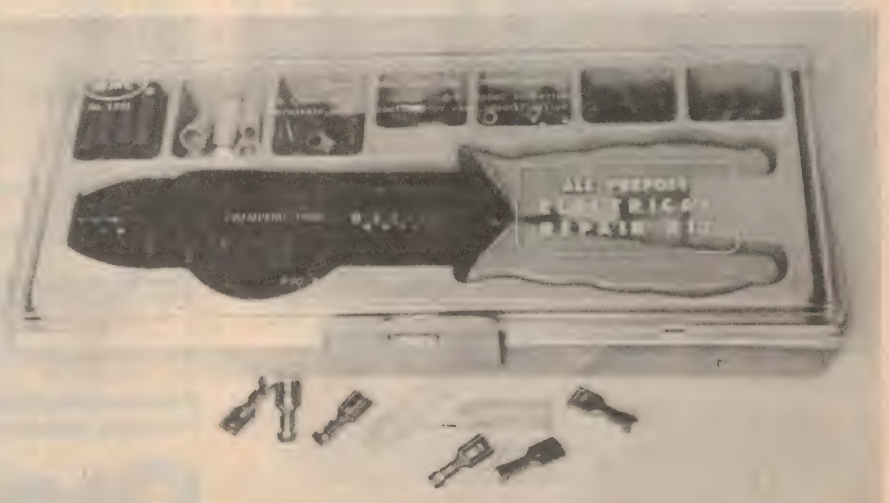
nected in parallel will be adequate for this application.

All the remaining components, with the exception of Tr2 and Tr3, are mounted on a PCB measuring 140 x 60mm, designated type 77ps11. Both the 5V regulator (uA7805 or LM340T-5) and Tr1 (TIP32) are accommodated at the edge of the PCB so that they can be thermally connected to the chassis for heat dissipation.

Both the IC regulator and the TIP32 have the TO-220 style encapsulation. The heatsink tab of the TIP32 must be isolated from chassis and, if the power supply is required to have an electrically floating output, the same applies to the heatsink tab of the IC regulator. At the time of writing we were unable to obtain TO-220 mounting hardware but we were able to "gimmick up" a suitable mounting using mounting hardware for a TO-3 transistor.

There is provision on the PC board for a variety of combinations of resistors for the Tr2/Tr3 emitter resistances. We used three 0.56 ohm 5 watt resistors in parallel per output transistor, and any substitute combination should have roughly the same resultant resistance and total power rating. If the power rating seems excessive, remember that the resistors must be able to withstand short-circuit currents of up to about 20 amps total.

Mount the resistors so that they are



This crimping kit plus the Utilux connectors helps make rugged and reliable connections to the bridge rectifier, main filter capacitor and mains switch.

Rated G

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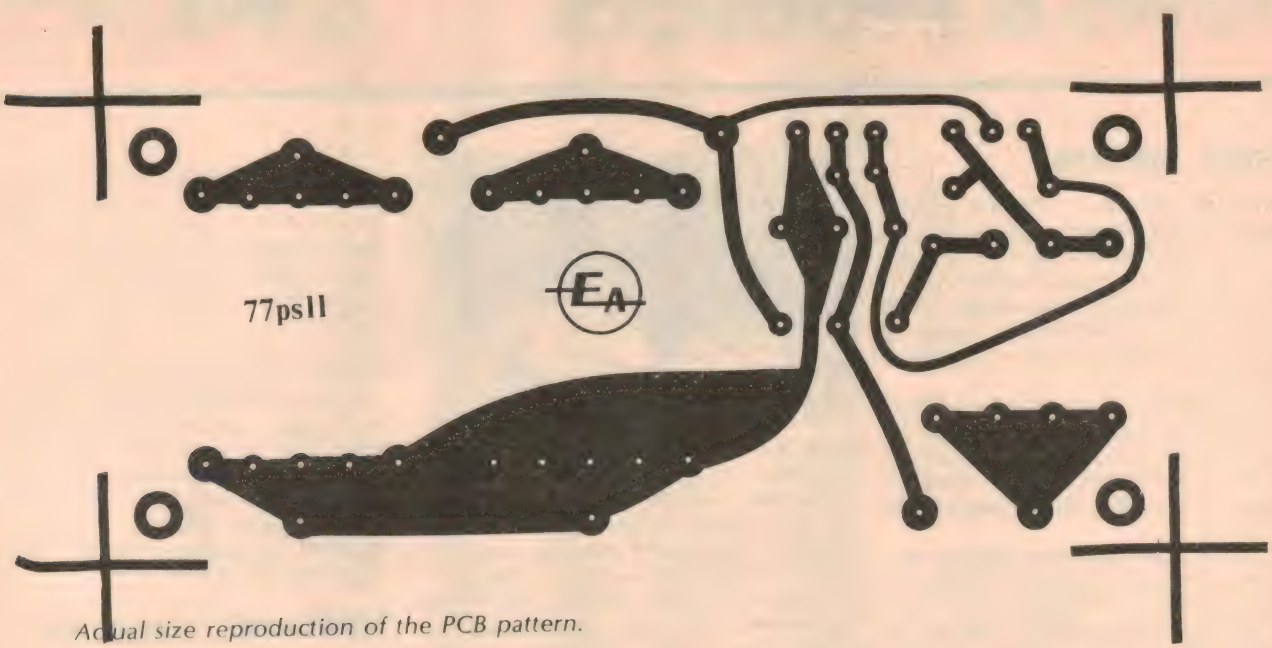


Actual size reproduction of the PCB pattern.

about 3mm clear of the PCB. This is to prevent the resistors from scorching the PCB in the event of an overload.

We used double-sided heatsinks for the output transistors. The heatsinks are spaced away from the rear of the chassis using 6mm metal spacers. We recommend TO-3 sockets for mounting the output transistors. Use a mica washer and heatsink compound for each transistor.

Use heavy duty insulated cable for all high current wiring. The type we used is known in the trade as "4mm auto cable". Connections to the filter capacitor were made with the aid of crimped spade lugs, while connections to the bridge rectifier and mains switch were via Utilux push-on "quick-connectors".

Ventilation of the case is assisted by raising the lid so that there is a gap of about 8mm along the bottom of either side, and about 18mm at the top along front and back.

All of the components for this project should be available in due course from Dick Smith Electronics.

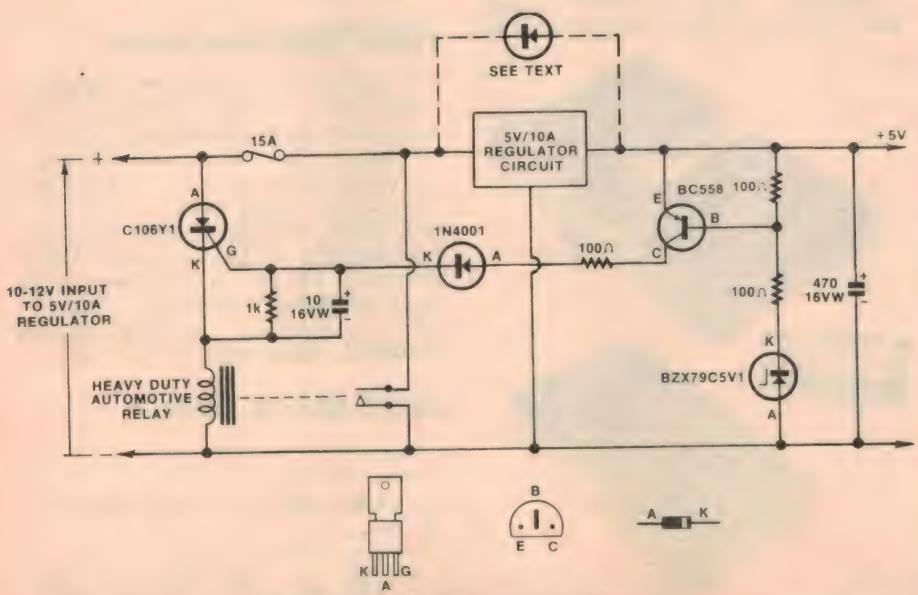
Now a few words about power dissipation and overvoltage protection. In spite of reasonable emissivity obtained with the double-sided heatsinks, the output transistors and indeed the whole unit will become very hot when operated at full load. Normally, the output transistors and the bridge rectifier will run at about 75 to 80 degrees Celsius (case temperature). If it is necessary to operate with elevated ambient temperatures (40°C or above) or with mains voltage above 250V AC, it would be wise to run the unit with reduced loading (say 8 amps) or arrange fan cooling.

For those who worry for the safety of their equipment in the case of power supply failure which increases the 5V rail, we have designed an over-voltage crowbar protection circuit. This has been proved on the bench but was not incorporated into the prototype.

The circuit monitors the output of the regulator and if the voltage rises above 6.2V (depends on the tolerance of the zener diode) it trips an SCR. The SCR energises a heavy duty relay which blows a 15 amp fuse in series with the regulator.

The relay we used was a heavy duty automotive type with suitable coil and contact ratings. Horn relays are strictly not suitable, as they are designed for intermittent use only. Headlight relays are suitable.

The diode shown dotted on the circuit is intended to discharge external capacitors when the crowbar operates, and thus protect the IC regulator. According to the ratings of the IC regulators used, the diode should not be necessary. Nervous types who wish to install it should use a heavy duty automotive type such as the BYX21L/200.



OVERVOLTAGE PROTECTION FOR 5V/10A SUPPLY

This optional circuit will protect external equipment in the case of a breakdown in the power supply.

Microcomputer News & Products

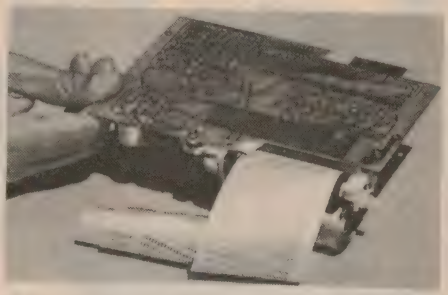
Printer module

The Gay "Printina" OEM-S printer module is a compact, moderate-cost unit likely to be of interest to computer hobbyists and other small system users. It features noiseless, non-impact printing, on rolls of metallised paper as used by many of the modern calculators.

The module comprises a single printed-circuit board assembly, which integrates both the printing mechanism and the electronics. The module measures 180 x 110 x 40mm, and weighs 330 grams.

The printer accepts input data in bit-parallel, column serial form, in either 6-bit ASCII code or 4-bit BCD code if only numbers are to be printed. The full 6-bit ASCII character set of 64 characters is available. Printing is via a 7-electrode sliding head, giving standard 5x7 matrix characters. Printing speed is 1.2 lines per second, with typical lines of 24 characters.

The printer module runs from a single DC power supply of either 5V or



6-8V. It draws 150mA in standby mode, and 500mA peak when printing. Data input and control input levels are all TTL and CMOS compatible. The inbuilt character generator may be used for external purposes, such as a display.

Cost of the Gay Printina OEM-S in quantities of 16 or over is $293 plus tax.

Enquiries to the Australian agents, Arlunya Pty Ltd, PO Box 113, Balwyn, Victoria 3103.

Cassette interface

The Applied Technology CT750 Cassette Interface has proved to be a popular peripheral for the computer hobbyist. Since its release in May 1977, demand has outpaced supply. Applied Technology has now rescheduled a faster production to keep pace.

As most users have found, the major advantage of the CT750 is that although it operates at the 300 baud "Kansas City" standard, it can be readily used at other speeds. In fact at 110 baud it virtually imitates the action of a "Teletype" paper tape punch/reader, and because most microprocessor evaluation kits have a 110 baud serial interface this is the most common use of the CT750. Other features include the recovered clock (300 baud), LED status lights, TTL carrier detect signal (for software search) and internal clock facility.

To ensure long term reliability Applied Technology can now supply a test tape with full aligning instructions so the user can check the calibration of his CT750 at any time. The CT750 is available in assembled and tested form and carries a 12 months' warranty.

For more information contact Applied Technology Pty Ltd, PO Box 311, Hornsby, NSW 2077.

Applied Technology CT750 Cassette Interface with cassette player and test tape.

'Kilobaud' magazine

Although it commenced publication in only January this year, "Kilobaud" magazine has grown very rapidly and is now regarded by many as second only to "Byte" among the US computer hobby magazines. Like Byte, it carries many articles on custom hardware and interfacing.

Local hobbyists will no doubt be interested to know that Kilobaud is now being imported and distributed by the Byte Shop, at 17 Arawatta St, Carnegie, Victoria.

The cost per issue is $3.50, which includes air mail postage from the USA. Back issues are available.

Enquiries to The Byte Shop, PO Box 156, Carnegie, Victoria 3163.

New England club

A group of enthusiasts in Armidale, NSW, has formed the New England Computer Club. Base is the University of New England, but membership is in no way limited. The University's Geophysics department has made a laboratory available for meetings, etc. Membership is $10 per year, and all enquiries should be directed to the New England Computer Club, c/- Union, University of New England, Armidale, NSW 2351.

2650 users' group

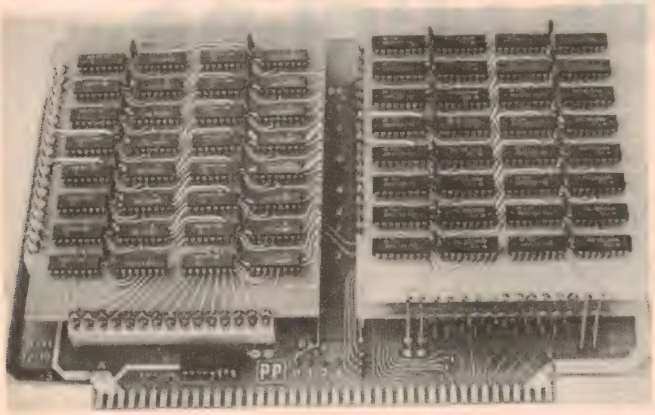
Applied Technology Pty Ltd has announced the formation of the Australian 2650 users' group. Main aim of the group is to arrange for the systematic interchange of software and hardware notes now rapidly appearing for this popular microprocessor. Applies Technology will donate its own considerable software base to the group and Philips-Elcoma have agreed

to make available all publicly released material.

At present a major software competition has been announced in the USA and a similar competition is planned for Australia to highlight the possibilities of the 2650.

For more information contact Applied Technology Pty Ltd, PO Box 311, Hornsby, NSW 2077.

Stackable RAM planes



Pennywise Peripherals are now able to supply "RAM Plane" memory kits, based on 2102 static memory chips. The kits are based on a stackable printed circuit board module — the actual RAM Plane — which takes up to 32 chips to provide 4k bytes of memory. Each 1k byte segment on the PCB may be separately selected. The RAM Plane PCB is available by itself, or as part of a complete kit.

The firm also has a memory mother board, capable of accepting up to 4 RAM Plane cards to provide up to 16k of memory. The mother board has dual address buffers, decoding, data latches and receivers, and is especially designed to run off either a 6800 or 8080 system. The picture above shows a mother board with three RAM planes — one mounted via Molex sockets, and the other two simply via connecting wires.

RAM Plane PCBs sell for $15.75 each; complete kits for $89.30. The mother board comes as a kit for $37.60. These prices include sales tax and postage within Australia, but sockets are extra. Enquiries to Pennywise Peripherals, 19 Suemar Street, Mulgrave, Victoria 3170.

Home computer from Tandy

The latest entry to the consumer computer market in the USA is the Tandy Corporation, which has just released a complete microcomputer system based on the Zilog Z-80 microprocessor. Called the TRS-80, the system is being marketed under the "Radio Shack" brand name, through selected stores in Tandy's chain of 5000 outlets.

The TRS-80 comes complete, not as a kit. It consists of four items: a keyboard/computer unit, a 30cm video display, a power supply and a data cassette recorder. Within the keyboard/computer unit is 4k bytes of dynamic RAM, 4k bytes of ROM, and a cassette interface. The ROM has a resident interpreter for BASIC programming, capable of handling floating-point arithmetic and numeric, array and string variables.

Price of this basic system in the USA is a very attractive $599.95, with the keyboard/computer unit also available alone for $400. A memory expansion option is also available, which expands the ROM to 12k bytes and the RAM to 16k bytes for an extra $280.

On the software side, the TRS-80 comes with a cassette of computer games. Applications packages for business, education, home and personal finance are available, at between $5 and $20 each. Various peripherals are also coming — including a mini floppy disc and a printer.

As it stands, the TRS-80 is not directly suitable for Australia, but apparently Tandy is working on that, too.

Test tone generator for transmitter checks

Here is a handy test tone generator for checking the performance of AM, FM and SSB transmitters—and CB transceivers. It can also be used for setting up tape recorders and noise limiting systems. It provides either a single 1000Hz tone, or a 500/2400Hz two-tone signal, and output coupling may be either acoustic or electrical.

by IAN POGSON

There are many instances where a source of sine wave audio tone is required to make tests and measurements. The tone source to be described here has its main application for modulation testing of AM, FM and SSB transmitters and transceivers, but should also be useful for testing and setting up various pieces of audio gear.

For AM and FM transmitters (and transceivers), a single tone is required and 1kHz is a frequency commonly used. For SSB mode tests, a two-tone source is required and our unit provides for a composite tone consisting of 500Hz and 2.4kHz.

This unit should be useful to technicians who have the task of checking commercial communications equipment, including that for the Citizens Radio Service. Also, amateurs will find it of use for checking either commercial or "home brew" equipment.

Where commercial equipment is to be tested with the tone facilities, ideally the tone(s) should be fed into the unit from the electrical output point. This may necessitate making up a test jig whereby a plug which fits the microphone input is suitably wired to cope with any push-to-talk facility, as well as feeding in the tone to the audio system. The other end of the cable will be fitted with a plug mating with the outlet provided on the Tone Source.

On the other hand, there may be reasons why it may not be convenient to feed the tone in electrically, either for test purposes, or for using the tone for MCW transmission purposes. We have therefore provided an alternative: using the transmitter's normal microphone, placed over the loudspeaker provided. For single tone use this method may normally be used quite satisfactorily. However, due to problems associated with the frequency response of the miniature speaker, combined with the microphone, it is not likely that this approach will be satisfactory for two-tone testing.

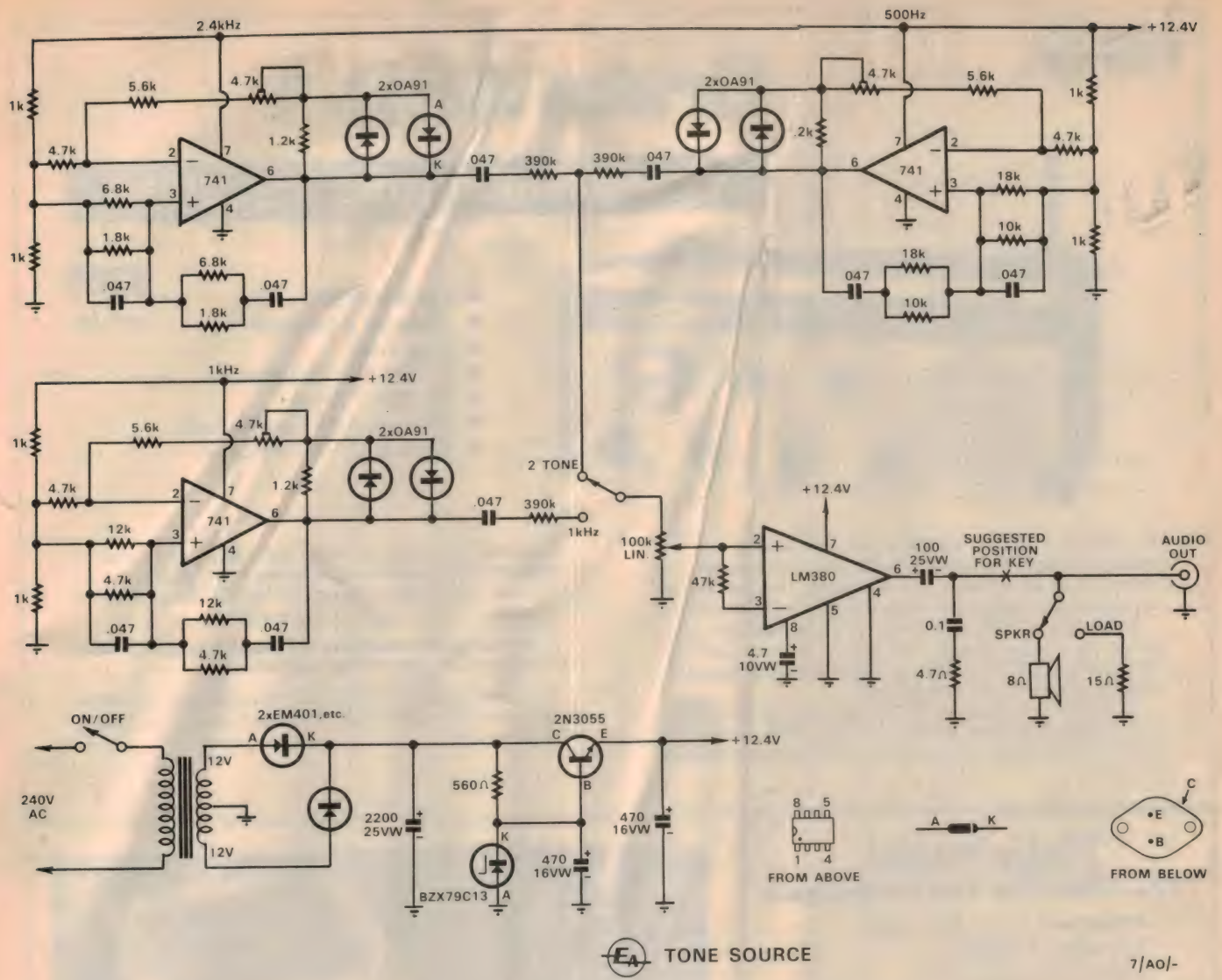
The completed prototype provides either a single 1000Hz tone or a 500/2400Hz two tone signal. Coupling may be either acoustic or electrical.

A look over the circuit should help to make the overall concept somewhat clearer. The basis of the unit is three sine wave oscillators, one each on 1kHz, 500Hz and 2.4kHz. These oscillators are identical except for frequency determining resistor values. The oscillators are based on the Wien bridge circuit, and use the 741 op-amp IC.

A .047uF capacitor in series with two resistors in parallel, and this in turn in series with another .047uF capacitor in parallel with two more resistors in parallel, constitute a Wien network in the positive feedback path. Two OA91 diodes in parallel with opposite polarities, in series with a 4.7k trimpot and a 5.6k resistor form the negative feedback circuit. Crossover distortion from the OA91 diodes is virtually eliminated by shunting them with a 1.2k resistor. A single power supply is made possible by adding a voltage divider consisting of two 1k resistors across the supply, with the junction forming the reference point.

Output from each oscillator is taken via a .047uF blocking capacitor, in series with a 390k resistor. The output from the 1kHz oscillator is taken to one pole of a selector switch. The outputs of the other two oscillators are tied together and taken to the other pole of the selector switch.

A 100k linear potentiometer follows the selector switch, as a level control. Output from the level control goes to the input of an LM380 audio amplifier IC. A 47k resistor is added across the + and



– inputs to reduce sensitivity. Levels are adjusted to give a nominal audio output of about 100mW, which is adequate for our purpose. A stablising network consisting of a 0.1uF capacitor and a 4.7 ohm resistor in series is connected across the amplifier output.

The amplifier output goes straight to an output socket as well as to a toggle selector switch. The switch selects either the loudspeaker or a resistive load. Heat sinking for the audio amplifier IC is via pins 4 and 5, to the earth copper on the printed board. Provided that the power output is kept to 100mW or so, this amount of heat sinking should be quite sufficient.

The power supply is a conventional type of series regulated circuit. Rectification is full wave, using two silicon diodes and a centre tapped transformer secondary winding. The series regulating transistor is a 2N3055 with its base referenced to a 13V zener diode. This provides a nominal regulated output at 12.4V. Adequate filtering is provided with one 2200uF and two 470uF electrolytic capacitors.

It may be questioned as to why such a large power transistor is used for the series regulator when only a modest amount of current and power has to be handled. The reasons are that the 2N3055 is readily available, the price is low and even if the output should be short circuited, it is not likely to damage the 2N3055.

A few comments on components may be helpful. Resistors, capacitors, diodes, switches, the transistor and ICs are all readily available items and should present no problems. The printed circuit board should be available through normal components outlets. However, if any trouble is experienced in getting a board, no doubt they will be available directly from a number of manufacturers. Our board was kindly supplied by RCS Radio Pty Ltd in Sydney and supplies may be obtained from this source.

The power transformer is one of the regular catalog lines (PL24/5A) made by Ferguson Transformers Pty Ltd in Sydney. The printed circuit board is made to take this particular transformer but it may be possible to fit one of another make. Supplies of the Ferguson type should be available through the usual outlets.

The box with its aluminium panel is imported by Dick Smith Electronics and supplies are available from this source. Alternatively, your local supplier may be able to get one from Dick Smith for you. The same comments apply for the speaker. On the other hand, similar speakers should be available from other suppliers. Although we have specified the 51mm size, there is room on the panel for the 57mm size if one is more readily available.

Assembly of the unit is fairly straightforward but a few comments may be helpful. When fitting the components to the printed board, it is a good idea to start with the smaller items, such as resistors, diodes and the smaller capacitors. When soldering, it is important to make good soldered joints without overheating the components. To this end, a small but adequately hot soldering iron is required. Also, items requiring it should be orientated with respect to the correct polarity. This applies to diodes, electrolytic capacitors and ICs.

There are different schools of thought relating to the use or not of sockets for the ICs. There are arguments both ways

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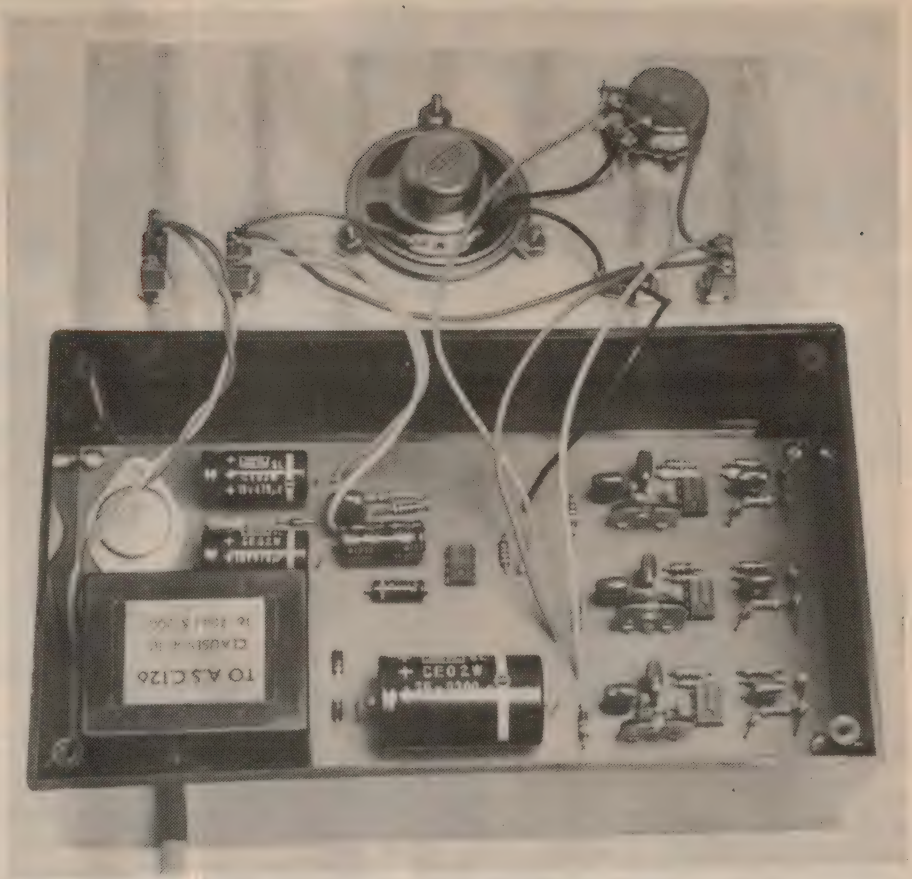
and the final choice is up to the builder. However, provided that the builder is sufficiently experienced in soldering, we consider that it is a better proposition to solder the ICs straight to the board.

With the smaller items fixed to the board, the larger items such as the electrolytics can follow, finishing with the power transformer. Leads from the board to such items as the switches, level control speaker, and audio output socket should be provided. The appropriate items may also be soldered to the leads in a temporary fashion, so that the unit may be tested and set up before being finally fitted to its box. The three leads of the power cord should also be connected up, without the run to the on/off switch on the panel.

Before proceeding further, a thorough check should be made to make sure that all items are in their proper place and correctly orientated. When you are satisfied that all is well, the unit is ready for testing. A word of warning at this point is to draw attention to the fact that the mains supply is terminated on the board. Precautions must be taken to ensure that accidental contact with these terminations is not possible—perhaps a piece of insulation tape stuck over the copper pads.

In order to carry out the testing procedure, a CRO is needed, perferably one that is calibrated. If it is not calibrated, then a high impedance AC voltmeter will be needed as well.

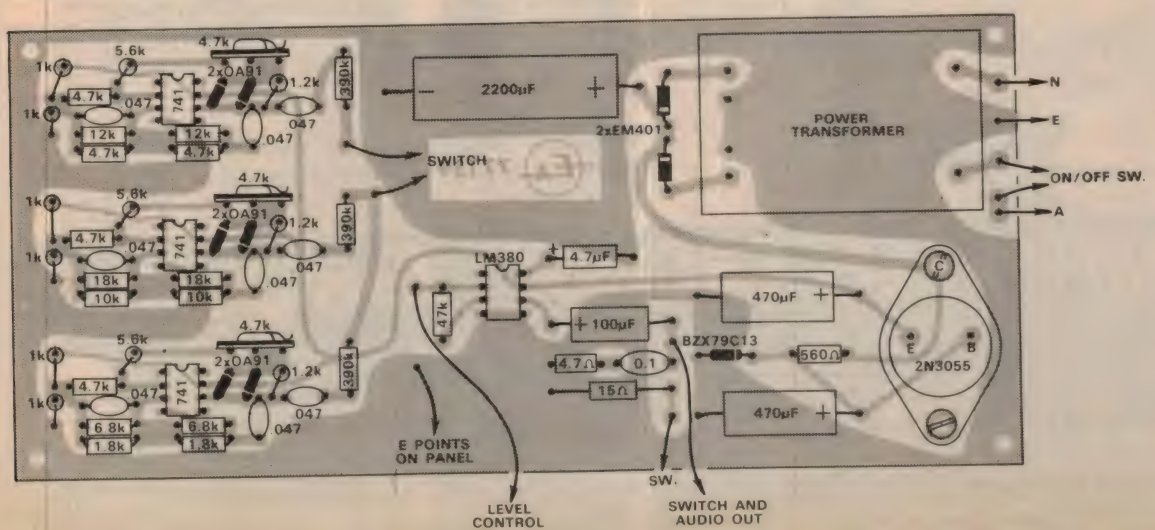
Before switching on, set the three 4.7k trimpots to mid-position and the 100k level control right off. Switch on and measure DC voltage between the emitter of the 2N3055 and earth. It should be nominally 12.4V, although it is likely to depart from this value due to spreads in the zener diode. With a 5% tolerance zener diode, the departure from the nominal 12.4V would be 0.65V either way.



This internal view shows the prototype with wiring completed.

To set up the oscillators, connect the probe of the CRO between the junction of the .047uF capacitor and the 390k resistor of the 1kHz oscillator. If there is no signal on the CRO the 4.7k trimpot should be rotated to increase its resistance, until a signal appears on the CRO. Now proceed to adjust the trimpot to get a signal which is 2V peak-to-peak. If the CRO is not calibrated, then an AC voltmeter should be connected in parallel with the CRO and the meter should read 0.7V RMS. Each of the other two oscillators should now be set up in the same way as for the first one.

It will have been noticed earlier that there are two pairs of parallel resistors in each oscillator. This has been done so that a suitable value of resistance can be arrived at to give the three nominal frequencies. For most practical purposes the frequencies obtained will be quite satisfactory. However, if you have a frequency counter and you wish to bring the frequencies closer to the nominal values, then this may be done by changing the appropriate resistors.



The component overlay diagram shows the PC board viewed from the component side.

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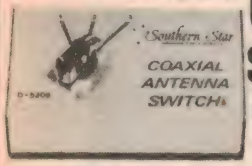

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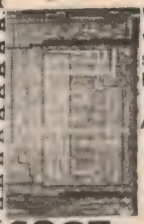

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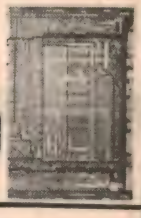

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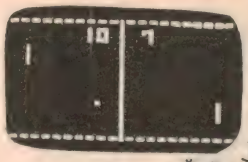

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Tone generator

With the adjusting and setting up completed, the components may be fixed to the aluminium panel. The level control, switches and audio output socket each require one hole for mounting. However, the small speaker may either have one large opening about 40mm in diameter, or several small holes about 3/16in diameter may be drilled in a pattern to allow the sound from the cone. I prefer the latter at it provides some protection for the cone.

As there are no mounting holes provided on the miniature speaker, an alternative method must be used to fix it to the panel. Perhaps the most primitive method would be to glue it to the panel. Another way is to make up three small brackets which can be screwed to the panel, as well as forming clamps for the edge of the speaker frame. Possibly the easiest and a very satisfactory way is to drill three screw clearance holes in the panel, equally around and close to the edge of the speaker frame. Then with three screws, with washers and nuts, the speaker is secured in place.

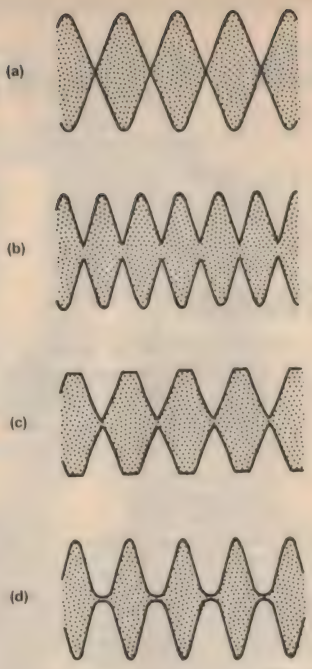
So that a microphone may be placed face down, facing the cone of the speaker, some sort of padding is required between the two items. A piece of foam plastic or rubber about 13mm thick is ideal. There is no need to cut a hole to let the sound through from the speaker, as the foam is remarkably transparent in this regard. With the foam cut to size, it may be fixed in place with some rubber cement.

The foam padding which we used was a piece of scrap which happened to be handy. However, if you do not have a suitable piece already, then it should be possible to get some at one of the many shops selling foam in all shapes and sizes, such as Clark Rubber Stores Ltd in the Sydney area.

The unit should now be ready to be fitted to the box. The board is stood off the bottom of the box with four spacers, ½in length and tapped to ⅛in Whitworth. Four holes are required in the bottom of the box for mounting. Another hole is needed on one side of the box to pass the power flex. Immediately on the inside, the flex should be clamped and the leads are then terminated on the printed board, the circuit including the on/off toggle switch on the panel.

No wiring details are given for the interconnections to the items on the panel but there should be no problems here, as it is quite easy to wire them according to the circuit.

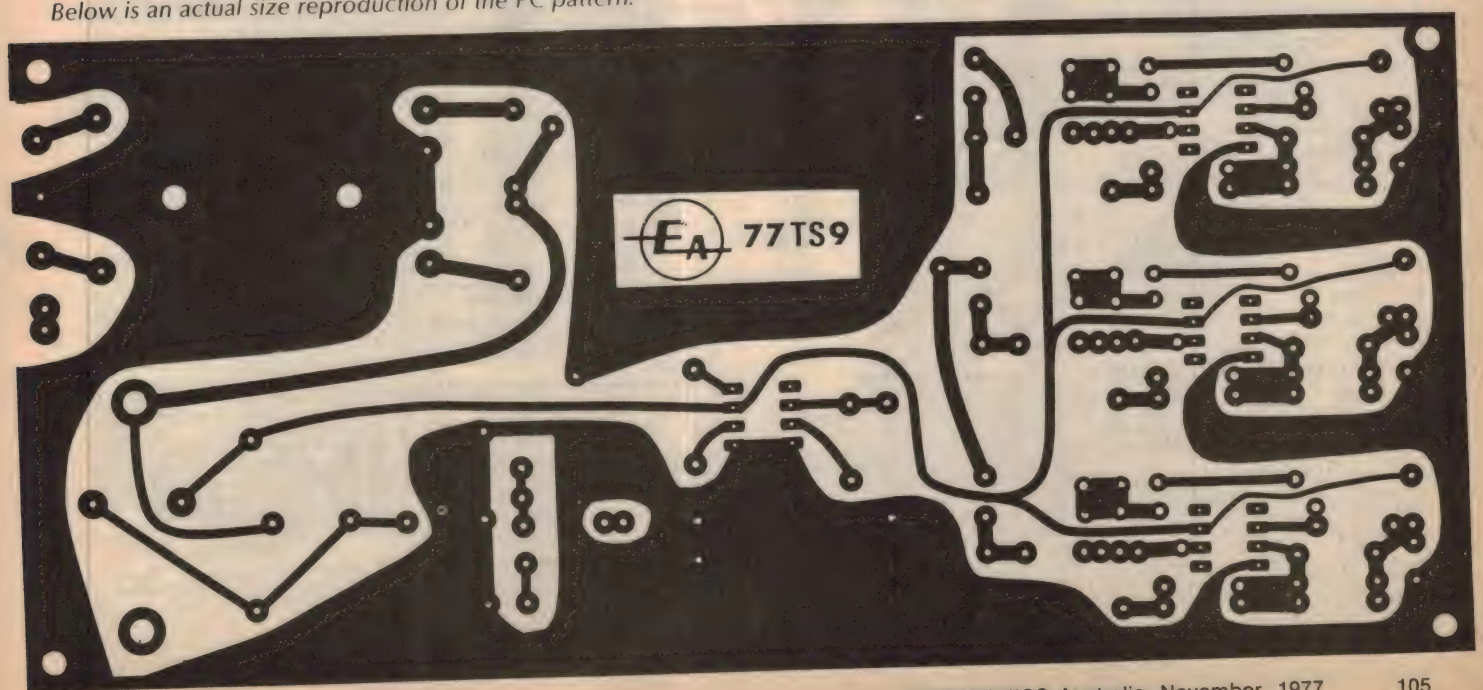
Some comments on the possible uses and applications of the Tone Source may be helpful. Firstly, there are two possible ways of taking off the signal, as already mentioned. Perhaps the simplest way is to use the microphone and speaker combination but as pointed out earlier, this has limitations as far as SSB testing is concerned. Fortunately, it is not difficult to make up a small cable with plugs to suit, along with a PTT switch. By this method, the microphone and speaker are eliminated and all methods of use may be done in this way.



These patterns show what the signal could look like after passing through the transmitter, as viewed on a CRO. Refer to the text for an explanation of each.

When using the microphone and speaker method, the level required for proper modulation may be readily adjusted with the level control provided on the unit. However, when using the direct electrical takeoff, it may be a little difficult to set the level control precisely at the low level required. If this should be the case, then another potentiometer could be introduced into the cable assembly which is made up. Between the

Below is an actual size reproduction of the PC pattern.



Tone generator

If you wish to make use of the single tone for MCW use, then either method of takeoff may be used. In this particular case, by using the microphone and speaker method, there is a ready means of monitoring one's own transmission. The tone may be keyed by breaking the lead from the junction of the 100uF and the 0.1uF capacitors and the switch and "audio out" socket, and inserting the key in this line.

Use of the single tone for testing amplitude modulation may be achieved equally well by using either electrical or acoustic output from the Tone Source. The usual methods may be used, taking some of the output from the transmitter and feeding it into the Y plates of the CRO. Then the CRO timebase will be set to a suitable rate, thus giving the usual modulation envelope pattern. Alternatively, some audio may be taken from the modulator output and fed into the Z plates of the CRO. This gives a vertical line on the CRO when the carrier is unmodulated, changing to a triangle for 100% modulation. Either of the above patterns will deviate from the norm if there is some sort of distortion on the signal.

Modulation tests for the SSB mode are somewhat more involved than tests for the AM mode. A single tone may be used to check the performance of the final linear amplifier at peak signal conditions. However, this does not give any indication of the actual linearity of the amplifier. To do this, a two-tone audio signal is used. Two well-separated frequencies are chosen and when mixed together, form a beat with its characteristic pattern, at a rate corresponding to the difference between the two frequencies. The top one of the four patterns shown indicates what this looks like on the CRO when the CRO timebase is correctly adjusted.

The two tone frequencies which we have chosen are at 500Hz and 2400Hz. These will give a beat or repetition rate at 1900Hz. With the timebase on the CRO set to about one fifth of 1900 in terms of sweeps across the face of the tube, you will get the pattern as shown in the top figure.

Perhaps it would be well to mention at this stage that in cases where the actual bandwidth of the transmitter is less than 2400Hz, then a lower frequency may be chosen. As an example, 800Hz and 1800Hz are sometimes used.

Let us take a look at the rest of the patterns shown and what they mean when viewed on a CRO, after the signal has passed through the transmitter. As mentioned earlier, the top signal is as generated by the Tone Source and if this is the pattern also which emerges from the transmitter, then the transmitter is correctly adjusted. The second is due to a fault in the generator, in that the two tones are not equal in amplitude. This should be put right before further tests are undertaken.

The third pattern shows a considerable amount of clipping, due to excessive drive. The fourth pattern indicates that the bias applied to the linear amplifier is wrong and should be adjusted to get the "X" type of crossover as shown in the top pattern.

While it is outside the scope of this article to describe a full test setup for SSB transmitters, a brief description of what is normally required may be helpful. As already indicated, the two tone signal is injected into the microphone input of the transmitter. The output of the transmitter is fed into a dummy load to suit the transmitter with regard to impedance and power rating. In the line between the transmitter and dummy load is inserted a pickup device so that a small amount of the signal may be tapped off and fed into a tuning unit, tuned to the output frequency of the transmitter.

The usual procedure then is to connect the output of the tuned circuit across the vertical deflection plates of the CRO. However, with many modern CROs, the facility to gain access to the vertical plates is lacking. Presumably in these circumstances, and provided that the CRO vertical amplifier has sufficient bandwidth, the output of the tuned circuit could be fed to the vertical amplifier input of the CRO.

PARTS LIST

1 Zippy box 196mm x 113mm x 60mm
3 Miniature toggle switches, SPDT
1 RCA single hole mounting coax socket
1 100k linear potentiometer
1 Knob
1 Miniature speaker, 51mm diameter, 8 ohms
1 Printed board 190mm x 86mm, code 77TS9
4 Spacers ½in long tapped ⅛in Whitworth
4 Rubber feet for box
1 Foam plastic pad 107mm long x 60 mm wide x 13mm thick
1 3-core power cord 2 metres
1 3-pin plug
3 ICs, 741 8-pin DIL
1 IC, LM380 8-pin DIL
1 Transistor 2N3055
6 Diodes OA91 or similar
1 Zener diode BZX79C13
2 Power diodes EM401 or similar
1 Power transformer, Ferguson PL24/5VA

CAPACITORS
9 .047uF 100V greencap
1 0.1uF 100V greencap
1 4.7uF 10VW electro
1 100uF 25VW electro
2 470uF 16VW electro
1 2200uF 25VW electro

RESISTORS (½W unless stated otherwise)

1 4.7 ohms	*2 6.8k*
1 15 ohms	*2 10k*
1 560 ohms	*2 12k*
6 1k	*2 18k*
3 1.2k	*1 47k*
2 1.8k	*1 100k linear potentiometer*
5 4.7k	
3 4.7k trimpot	*3 390k*
3 5.6k	

MISCELLANEOUS
Hookup wire, solder, screws, nuts, clamp for power flex.

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used on the prototype. Components with higher ratings may generally be used, providing they are physically compatible. Components with lower ratings may generally be used, providing ratings are not exceeded.

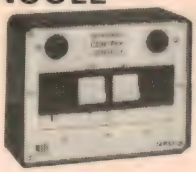
M.R. ACOUSTICS

P.O. Box 110, Albion, Brisbane 4010,

present the quality range of QED audio accessories from the U.K.

SPEAKER CONTROL CONSOLE

This stylish console provides control over two pairs of headphones and up to four pairs of speakers, any combination of which can be selected without the risk of damaging an expensive amplifier. (See specification.) Being suitable for either surface or flush mounting, the speaker control console will provide the answer to your multi-speaker home installation problems.



Technical Specifications

Size (mm): 130 x 100 x 50.
Colour: White panel with surface mounting box.
Switches: Rocker Type.
Current Rating: 5 amps (150 watts RMS).
Headphone Outlets: ¼" Stereo Jack sockets.
Loading: Using 8 ohm speakers the impedance never falls below 4 ohm.
Termination: Screw Terminal (Wire entry through underside of box).
Mounting: Surface or Flush. (Screws supplied.)
Wiring: Independent earth.
Functions: 16 combinations of pairs of speakers. All speakers can be turned off without damaging the amplifier.

$35 each R.R.P.

TAPE SWITCHING UNIT

Many amplifiers have facilities for connecting only one tape recorder. Now, with the addition of this new tape switching unit, three compatible tape decks (whether reel to reel, cassette or cartridge) can be connected and operated without having to change leads by hand.

The controls provided allow for inter-recording between machines as well as playback and record from either. Simultaneous recording onto all three machines is also possible. Monitoring can be from the source or via the monitor output socket fitted to most tape decks. Fitted with 5 pin DIN sockets.

SIZE (mm) 130 x 100 x 50

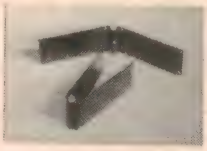
$32 each R.R.P.

SPEAKER MOUNTING BRACKETS

● Specifically designed for mounting lightweight speakers ● Can be "locked" in correct position after fitting ● Precision made (Black etch stove finish) ● Easy and safe to fit ● Complete with screws and rawlplugs.

Advantages of using Mounting Brackets

(1) Isolating speakers from each other and the rest of the Hi-Fi system can reduce the risk of acoustic feedback and unwanted shelf resonances.
(2) Speaker angle can be adjusted to obtain the best stereo image.
(3) As the Brackets cannot be seen when in use, there are fewer restrictions as to where speakers can be mounted.



SIZE 127mm x 51mm (CLOSED)

$13 pair R.R.P.

SPECIFICATIONS —

Horizontal Movement: Up to 130 degrees. **Maximum Loading:** 15lb (7kg). **Material:** 16 S.W.G. (Steel Plate). **Finish:** Black Etch Stove

DISC SWITCHING UNIT

Very few amplifiers have facilities for connecting two record player decks (with magnetic cartridges). The Disc Switching Unit enables two such decks to be connected and controlled without changing leads by hand, suitable for wall mounting and fitted with professional quality phono sockets.

Technical specification

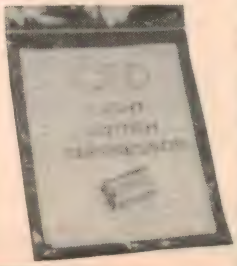
Size: (mm) 100 x 65 x 50
Colour: White panel with black surface mounting box.
Switch: 2 position rotary.
Termination: 6 off phono sockets professional quality
Connecting leads: A total of three phono to phono leads are required.

To enable the DSU to be used with equipment fitted with DIN connectors, a 5-way DIN to 2 phono plug lead/leads will be required.

$21 each R.R.P.

LIGHT SWITCH SUPPRESSOR

Radio frequency interference generated by domestic light switches and reproduced via the audio system in the form of "clicks" etc, can now be overcome simply and quickly by using the Light Switch Suppressor, easy to fit — no soldering! Supplied in display pack complete with full instructions — one suppressor required for each light switch.



Please note: When used for suppressing fluorescent lights, the suppressor should not be fitted to the light switch but to the mains input terminal block on the light itself.

$3.50 each R.R.P.

Input Comparator/Output Comparator

These Comparators have been designed to provide an economic and reliable means of comparing record decks, tape decks, amplifiers and loudspeakers. The separate input and output units allow for a greater freedom of choice when deciding what facilities are required.

Input Comparator specification

Tape Inputs: Six
Disc Inputs: Six
Amplifiers: Six
Sockets: 5-way 180 degree professional quality DIN sockets.
Case Size: (mm) 432 x 127 x 64
Case Finish: Anodised aluminium panels with extruded sections. Black leather textured PVC top. Supplied with rubber feet.
Wiring: Fully screened

Output Comparator specification

Amplifers: Six
Speakers: Twelve Pairs
Sockets: 2-way DIN
Case size: (mm) 432 x 127 x 64
Case Finish: Same as Input Comparator
Wiring: Independent earth

Trade enquires — price on application.

SPEAKER VOLUME CONTROL

Order code 4/3 & 4/4*

The Speaker Volume Control has been designed to provide "in-room' control over the volume of an additional pair of speakers remote from the main amplifier. This product is particularly suitable for persons requiring speakers in several rooms, whilst still being able to control each pair individually. It is also possible to turn off this control without affecting any others.

Technical specification

Size: (mm) 130 x 100 x 50
Colour: White panel with black surface mounting box
Switches: 5 position rotary
Power rating: 40 watts RMS.
Loading: Constant impedance.
Termination: Screw Terminal (wire entry through underside of box).
Mounting: Surface or Flush.
Wiring: Independent earth.

*Use model 4/3 for 8 ohm speakers and 4/4 for 4 ohm speakers.

$39 each R.R.P.

CABLE CLIPS

This range of self adhesive cable clips provides the ideal answer to securing cables of up to 19.00mm dia. They are quick, neat and easy to use.

The adhesive used is strong, long lasting and acts instantly. The polyethylene pad also provides a high level of insulation.

Technical specification

Clips per pack	Order code	Base size	Maximum cable dia.
30	13/1	11 x 16mm	6mm
20	13/2	15 x 19mm	10mm
15	13/3	12 x 26mm	12.7mm
12	13/4	16 x 26mm	19mm

Packs $2.08 each R.R.P.

QUADRAPHONIC SYNTHESISER

This "surround sound" adaptor attempts to provide some impression of the missing ambience present at all live performances. This information, normally lost when using conventional two channel stereo equipment, is present on all stereo programmes, whether disc, tape or radio.

The rear blend control featured in this unit allows complete control of the directional information between the rear speakers, resulting in a much improved spatial sound and a closer approach to realism.

Connecting simply to the output of most stereo amplifiers, the QED Synthesiser provides, with the addition of two speakers, that extra dimension felt when attending a live performance.

SIZE (mm) 130 x 100 x 50

$32 each R.R.P.

A new product due by approximately end of the year —

A six-outlet mains distribution unit with mains interference suppressor built in. Suppressor operates on all outlets with total power of 1500 watts (6.3 amps). Australian plug and sockets fitted, and lead is 2½ metres long. This neat and effective unit, comprising black box with white panel and sockets, measures only 200mm x 130mm x 90mm. R.R.P. expected to be $43.

Available from Hi-Fi stores or direct from M.R. ACOUSTICS

Add 50c pack and post for Light Switch Suppressor, $1 for each other item. Extra 50c gives certified mail insurance cover. Trade enquiries welcomed.

Classical Recordings

Reviewed by Julian Russell

Elgar — Overture in the South

ELGAR — Overture In The South (Alassio). VAUGHAN WILLIAMS — Fantasia on a Theme by Thomas Tallis. Overture The Wasps. Bournemouth Symphony Orchestra conducted by Constantin Silvestri. HMV Greensleeve Stereo Issue ESD7013.

To many, the name Bournemouth Symphony Orchestra might well suggest an English seaside band playing on a pier on a summer afternoon. Nothing could be further from the truth.

Oldtimers still talk of it being quite good back in the distant days of Dan Godfrey. But under the incumbency of the Rumanian conductor, the late Silvestri, it developed into an orchestra any Australian capital city might well be proud of. Those who heard his sumptuous recording of Rimsky-Korsakov's "Scheherazade" some years ago will remember the players' glowing sound and the conductor's delightful freewheeling style. They will not be disappointed with this budget priced issue of the same combination in the items listed above.

Silvestri, though Rumanian, was in complete sympathy with Elgar's music and those who remember Elgar's own style when conducting will recall that he was by no means a reticent director, especially of his own music. Silvestri starts "In The South" with just the right jauntiness and follows it with a theme so Elgarian that though it was inspired by the Italian scene it was unquestionably an Italy seen through English eyes as, of course, it was intended to be.

It is hard to understand why this fine overture is comparatively neglected in favour of the no better but just as beautiful "Cockaigne Overture", so popular with England's ex-Prime Minister, Edward Heath. All the first desk players are excellent and I must add a special word of praise for Cedric Morgan's lovely viola solo.

Silvestri moves without effort from the dolce far niente Italian atmosphere to the passage descriptive of the departed glory of the ancient Roman Empire. During the work the viola solo calls up a picture of the composer lying relaxed in the unaccustomed sunshine. The orchestration is of course magnificent especially in Elgar's characteristically magnificent scoring for the brass.

There are many treasures in this work and if some of them owe allegiance to Richard Strauss, there are many that are true Elgar. The sound is fine and resonant. By the way I must mention that on my pressing the lables had somehow got stuck on the wrong sides — not a very worrying error if you happen to know the pieces played.

In Vaughan Williams' great "Tallis Variations", Silvestri shows just the same understanding of this composer as he does of Elgar. Here is a performance I praised very highly when it was first issued some years ago. It has spaciousness and majesty, and I still react to it with the same enthusiasm.

Despite the conductor's markedly romantic temperament it is none the less a noble reading and it would be difficult to imagine two more different personalities than the mercurial Silvestri's and the granitic Vaughan Williams'. Yet if you follow Silvestri's passionate interpretation with a score you will see that he takes surprisingly few liberties. I am sure grand old VW would have loved it. At any rate it moved me deeply.

The acoustics are fine and it is worthy to appreciate that, while the Elgar was recorded in the Bournemouth Winter Garden, Winchester Cathedral was chosen for the Tallis. The Cathedral has exactly the right resonance and reproduces superbly identification of the three separate string groups.

But the same praise would be out of place for the performance of the overture "The Wasps". Here resonance and reverberation are very much out of place. Add to this Silvestri's unusually fast tempo and I found myself wondering why I enjoyed it so much. The piece is marked allegro vivace but Silvestri's speed is much closer to a presto, though he does spread the music out grandly in the slow middle section!

The combination of this speed and the reverberation makes some of the loud passages sound confused and the echos of the final chords sound simply silly. However, don't be put off by the faults of this comparatively minor piece, but enjoy instead the pleasure of listening to the two main ones.

HAYDN — Symphony No. 95 in C Minor. Symphony No. 101 in D Major (The Clock). Fritz Reiner and his Symphony Orchestra. RCA Stereo AGL1-1275.

This is another "recreation" of a 1964 recording, though in this Reiner uses what is described as "His Symphony Orchestra". There is no explanation in the sleeve notes as to who the players were or any account of its founding.

But whoever they were they were very good. Tonally I found this disc a shade more modern sounding than the one reviewed above, perhaps because of the lighter scoring and also the improvement in the original engineering which was produced some eight years after the Brahms Third.

Reiner's readings of both the Haydn Symphonies are very stylish indeed. Their dynamic proportions are always kept within the bounds of the composer's 18th century orchestration. His phrasing is a total delight and I can't imagine anyone guessing that the disc was remade from a 13-year-old original.

Some parts of "The Clock" sound as delicate as some of the very best contemporary engineering. Also Reiner, whenever he sets a tempo, as in the "Clock Symphony", sticks to it tenaciously. Any slight variation he introduces is due to logic and impeccable taste. True this metronomic beat is what has given the first movement of "The Clock Symphony" its nickname.

If you want to quibble the last two chords are not attacked quite as unanimously as they might be. A pity, but you'd have to be pretty churlish to complain. Throughout both symphonies, the dynamic variations are always decorative enough to rivet admiring attention.

There is a tendency to treat Haydn's symphonies nowadays, especially his later ones, rather more weightily than Reiner does. But, to me, Reiner strikes just the right medium. I admit that others might think Reiner's treatment a trifle too dainty but none could challenge his perfect judgement of contrasts and tempos. This, too, is issued at a budget price and I consider it a great bargain.

☆ ☆ ☆

BRAHMS — Symphony No. 3 in F Major. Chicago Symphony Orchestra conducted by Fritz Reiner. RCA Stereo AGL1-1280.

This is a remastered reissue of a performance recorded back in 1958, and a very good job has been made of it. The sound is very clear and usually well balanced though the strings are a bit wiry. There is no surface noise to betray its origin. I found I got the best result

L.E. CHAPMAN

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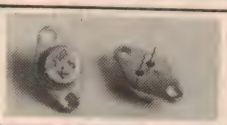
25 mixed transistors and diodes $2



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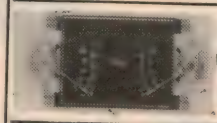

VU METER $3.00 pair

Gramophone Motor & Pickup
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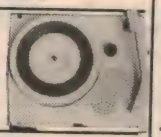
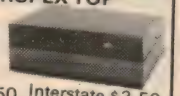


BASE AND PERSPEX TOP
for record player
Size 17¼ x 13½ x 6¼ **$10**
Pack & post $2.50. Interstate $3.50



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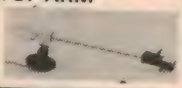
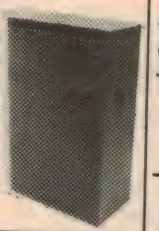


SPEAKER CABINET including 2 dual cone speakers, 6½ inch 10watts RMS **$16.** Size 16½ x 10¼ x 8. Pack & post Interstate **$5** a pair, NSW **$3.00.**



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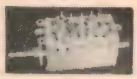
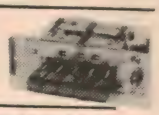


POWER TRANSFORMER
300 mil 240 volt; 115; 110; 6.3 **$5**

POWER LEADS
for tape recorders, etc. **75 cents**

CAR RADIO
push button tuner **$3**



TELESCOPIC AERIALS **$1.50**

3 position push button switch 50 cents

POWER TRANSFORMER
240 volt, 180 volt, 6.3.V 40/mil
$2.50

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on my equipment by reducing the highs and boosting the bass a little!

Reiner pushes the first movement along a little faster than is usual, though this might logically be argued to be in keeping with the dramatic statement of the first bars. However, in the quieter parts he shows no reluctance to remove the pressure. All through the symphony the Chicago, which Reiner did so much to improve during his fairly long stay with them, play very well indeed. However, despite the skill of its remastering it sounds a trifle thin compared with more recent recordings.

Reiner's insistence on clarity does away with the lumpiness of some of Brahms' scoring under the batons of other — and more recent — conductors. He establishes quite a different mood in his tender treatment of the following Andante but he takes the third movement much more like the previous one than the scherzo Brahms intended. It is smoother and without the rumbustiousness of Brahms' other scherzos.

Here I must mention the solo horn's lovely contribution, though all the first desk men are fine. He produces that remote, almost mysterious tone which I, having had my musical education in England, admire so much.

The finale is entirely satisfactory and, importantly, this new series of reissues, more of which I will review later, are put out at a budget price. Don't expect too much lusciousness or bloom, despite the skill of the remastering. Still, it serves very well indeed to remind one what a fine conductor Reiner was — and how quickly he seems to have been forgotten.

☆ ☆ ☆

RESPIGHI — The Pines of Rome. The Fountains of Rome. Minneapolis Symphony Orchestra conducted by Antal Dorati. Philips Stereo (Universo Series) 6582 015.

"The Fountains of Rome" has had a good innings since it was composed in 1817. If you're a regular concert-goer you'll be bound to hear it somewhere or other at least once a year.

The number of recordings sold by various companies must now run into pop figures. It was a favorite showpiece with the various overseas conductors who visited here to conduct the newly formed ABC Symphony Orchestra during the early 1930s. Indeed, back in those days, many of the audiences thought it daringly modern, and at least one old Sydney critic wrote of it as merely cacophonous and had one of his sons state in print that "I have nothing but contempt for the music of Bartok."

Those were the days!

The sleeve notes on this issue contain some interesting facts about the composer. He wrote 10 operas — all forgotten and most of them never receiving more than one or two performances in his native Italy. He studied in Russia with Rimsky-Korsakov — hence his brilliant scoring — and with Max Bruch in Berlin, yet his orchestrations of these two suites are more Straussian in style than either of the two first-named masters. And he was a violinist in a string quartet which toured America where some of his operas had a stillborn performance!

In the "Pines of Rome" he was the first composer to introduce a recording of a nightingale's song into the orchestra — a 78, of course, inaudible unless grossly amplified. In the same work he introduced into the same orchestra four buccine — ancient Roman curly trumpets that I have only ever seen in giant Hollywood historical films.

His scoring of the "Fountains" is more modest — a more or less conventional symphony orchestra.

The continuing popularity of these two suites is easily explained — they are easy to listen to, melodious, and graceful when played by most good orchestras and conductors. Above all both suites are picturesque in what has been called a picture postcard sense.

The first delicate movement is followed dramatically by the superb gushing of the "Triton Fountain at Noon", a real waterfall in music. By the way when I saw the Triton fountain there was only an unimpressive squirt coming out of it. Dorati seems to me to hurry this movement unnecessarily though I still listen to most of it with a good deal of enjoyment. And in the last item, "The Medici Fountain at Sunset", the luscious melody is decorated with birdsongs, bells and other crepuscular sounds.

Though it is a frankly romantic work, Dorati takes it all classically, carefully avoiding any Italiante extravagances. And the sound is really fine.

In "The Pines" I like best his two least exuberant middle movements. The first movement — the "Borghese Garden" — pays strong allegiance to very early Stravinsky. "The Appian Way" sequence is marked by the steady distance-consuming marching step of the ancient Roman legions with a triumphal return to Rome to finish. With modern recording techniques the nightingale's song in the pines is now easily audible.

Both suites seem to have outlived many other popular pieces of the period. To mention only two: Dohnanyi's "Variations on a Nursery Tune" and Falla's "Nights in the Gardens of Spain".

This issue is worthy of continuing Respighi's popularity in this field, though in my opinion other works of his such as "The Birds" and his arrangement of Rossini tunes in the ballet "Boutique Fantasque" deserve equal popularity.

☆ ☆ ☆

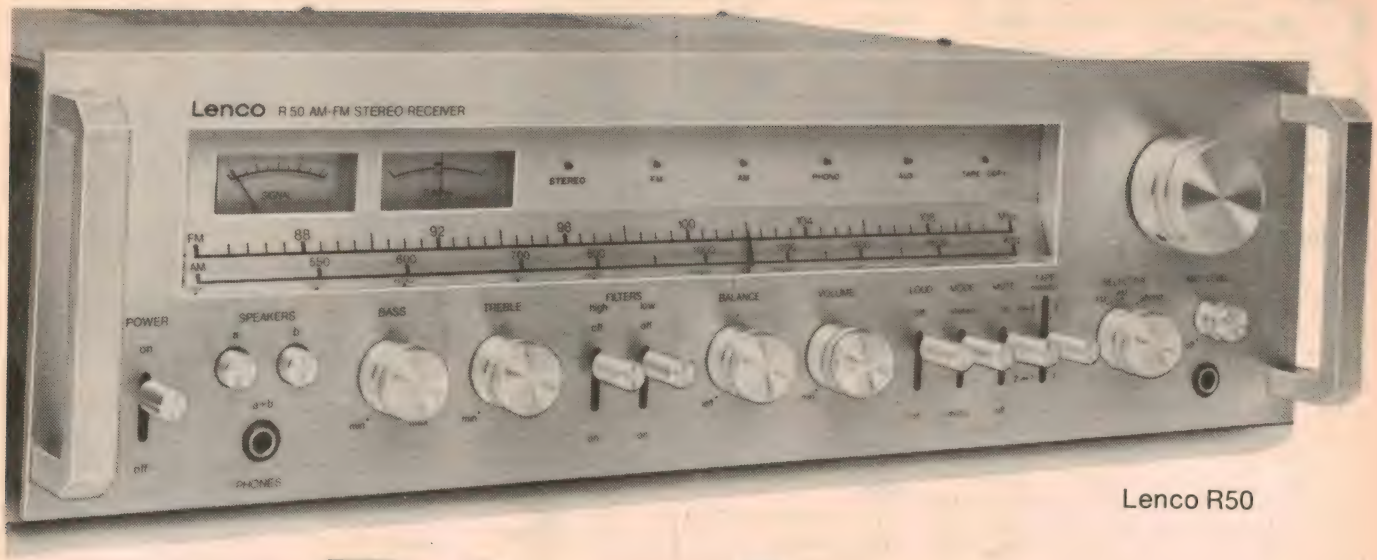
BACH J. S. — Six Partitas for Cembalo played by Stanislav Heller. Christophorus-Verlag Stereo BWV825-830. (Two discs.)

Last month I reviewed a disc with a label new to me — SFP. This month I have received another new label — Christophorus-Verlag from Germany. SFP is, by the way, French. The new issue offers "Six Partitas for Cembalo" by J. S. Bach. But before I go on I had perhaps better explain that the word cembalo can be used to describe very different instruments. In Hungary it is used as the name for a stringed instrument, rather like a big zither but with a heavier tone and struck by hand-held, felt-covered hammers. This is best known in Australia for its use in the Hary Janos Suite of Kodaly.

During the 18th century the word was frequently used in Europe to indicate a figured bass. In Italy it is a dulcimer and, in a slightly different form, cembalum, it is a jews' harp, that twanging device held between the teeth and which is neither a harp nor, so far as I can discover, Jewish. In this Christophorus issue it simply means harpsichord.

The six partitas here are recorded very clearly on a more than usually full-toned instrument. Stanislav Heller's Bach is very stylish without being mannered.

There is, alas, no space here to review all six separately but I can assure you that all are excellently played, expressive and technically immaculate. Changes of registration are used with discretion and unfailing good taste. In order to display their variety they are not recorded in numerical order, and unless you are a German scholar, you will find no information in the sleeve notes, which are in that language without an English translation. The two discs make a very high class production which can hold its own with any other of these six partitas.



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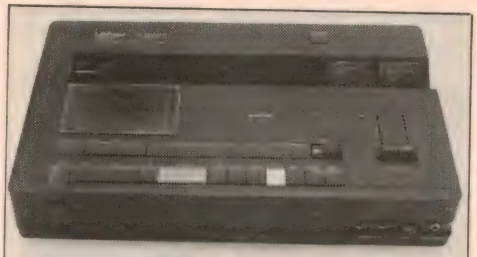

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Lighter Side

Reviews of other recordings

Devotional Records

JESUS OF NAZARETH. Original soundtrack, composed and conducted by Maurice Jarre. The National Philharmonic Orchestra. Stereo, Astor SPLP-1498.

I was in two minds whether this album should be included in the devotional section but I guess that, if it is sought out, it will be mainly by people who will come to associate it with the film. At the time of writing, I can judge the content of the film only by the title, the jacket notes which speak of the dedication of those who produced it, and the track titles which suggest a traditional portrayal of the life of Christ:

Jesus Of Nazareth — Annunciation — Three Kings — Baptism — Jairus' Daughter — Jerusalem — Salome — The Beatitudes — Miracle Of The Fish — Crucifixion — Resurrection.

The music itself is traditional orchestral sound — restrained, melodic, thematic and obviously related to the visual, with the "Salome" theme being unmistable. On side two the "Beatitudes" are recited with considerable feeling against an orchestral background by Robert Powell, who plays the part of Jesus. It confirms the nature of the album and, for many, will be the most played track.

The quality and surface of the recording are well up to standard and, if you get to see the film, and like the portrayal, this soundtrack recording should help you to retain the image. (W.N.W.)

☆ ☆ ☆

JOY IN THE MORNING. Ernie Rettino & Debby Kerner. Stereo, Maranatha HS777/19. (From S. John Bacon Pty Ltd, 12-13 Windsor Av, Mt Waverley, Vic 3149.)

"Joy in the Morning" is the title of this album and it is the conviction that these two young people are trying to convey in their songs: All Day Song — Mary Magdalene — In The Morning — The Wa Wa Song — Song of Solomon — Seek And Ye Shall Find Him — Motherless Child — He's Got The Whole World In His Hands — I Finally Appreciate — Shine On.

Most of the songs are their own compositions, ranging in style from a well performed soft rock sound to the quiet and intimate, but appealing predominantly to the teen/twenties group.

Singing, for the most part, in close harmony, diction is average — not clear enough to follow every word but sufficient to convey the main message of the lyrics and the sincerity of the performance as a whole.

Recording quality and the pressing itself are well up to standard. (W.N.W.)

☆ ☆ ☆

SOMETIMES ALLELUIA. The Sonlight Orchestra. Stereo, Myrrh MSA-6560. (From Sacred Productions Aust, 181 Clarence St, Sydney and other capitals.)

Conventionally, those "Jesus Songs", as the jacket notes describe them, the work of contemporary Gospel composers, are belted out by rock singers and rock groups, presumably to the delight of the "now" generation.

On this album, 10 such numbers are presented in purely orchestral form, with the lyrics printed on the sleeve to remind you what they're all about: I Can't Wait — Prince Song — You Got The Power — Sometimes Alleluia — Searchlight — I Am Your Servant — Say "I Do" — For Those Tears I Died — Clean Before My Lord — It Took A Carpenter.

While guitars are prominent enough to remind the listener of the derivation of the music, the arrangements and orchestration plus ye olde world cover design are obviously intended to convey the thought that modern Gospel can parade quite successfully in period costume. It's a novel idea and one that may interest Gospel groups who may want to develop a compromise format.

But let me sound a note of warning to hifi fans. Maybe it's the acoustics, or the recording requipment and/or the number of amplified instruments but the Sonlight Orchestra has a very "middly" sound here, that is evident from the very first groove. Fortunately, the sound is otherwise clean, as is the surface of the pressing, but it lacks boomp and it lacks sparkle. A pity. (W.N.W.)

Instrumental, Vocal and Humour

LAWRENCE WELK. Interfusion L252281. Festival release.

If TV themes are your bag, played by a big and competent orchestra, then this is the record for you, with twelve title tracks from American shows: Nadia's Theme from 'The Young And The Restless' – Baretta's Theme – Paloma Blanca – Feelings – Theme from 'Swat' – Champagne Time – 'Johnny' Theme – Star Trek – Love Will Keep Us Together – The Hustle – Making Our Dreams Come True – Happy Days.

The quality and big band sound are excellent, far better than the usual run of sound track records. (N.J.M.)

☆ ☆ ☆

FORTYMANIA. M7 Stereo MLR-190.

If the music of the forties is your bag, this disc would be a good way to grab a sample of both big band and vocal sound from that decade. Recorded in England at the Pye studios, it features such English artists as: Dennis Lotis — Rosemary Squires — The Polka Dots — Joan Baxter — The Mike Sammes Singers — The Al Saxon Big Band and the Richomd String Orchestra.

The 40 titles would take a page of their own, so a sample: In The Mood — Sentimental Journey — 12th Street Rag — Lazy River — Blue Moon — April Showers — Baby It's Cold Outside — Don't Get Around Much Any More.

The quality is excellent and the sleeve notes give a rundown on the artists who made each hit their own. Some of the arrangements lack a little of the sparkle of the original but this would be a small price to pay. (N.J.M.)

☆ ☆ ☆

JONAH JONES, GLEN GRAY QUARTET and the Cas Loma Orchestra. Capital Encore VMP 1008. EMI Release.

If like me you're old enough to remember the big bands of yesteryear you will really dig the musical offerings on this record. Trumpeter Jonah Jones puts everything into 12 tracks of

Reviews in this section are by Neville Williams (W.N.W.), Jamieson Rowe (J.R.), Leo Simpson (L.D.S.), Norman Marks (N.J. M.), David Edwards (D.W.E.) and Greg Swain (G.S.).

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THE LIGHTER SIDE

superlative quality that would put the disc into the "demo" class.

The titles: Baubles Bangles and Beads — Echoes Of Harlem — Two O'Clock Jump — I Can't Get Started — Boy Meets Horn — Hot Lips — After You're Gone — West End Blues — Ciribiribin — Tenderly — Sugar Blues — Apollo Jumps.

One curious thing about this disc is the amount of pre-echo preceding each track. I doubt if the Casa Loma Orchestra has the original performers, as it has been around for a long time. (N.J.M.)

☆ ☆ ☆

CARRIE. Original Motion Picture Sound Track. United Artists L36133. Festival release.

It is still a puzzle to me why the motion picture industry persists in releasing sound track recordings of nearly every film made, particularly in the case of a film like "Carrie" where, judging by the press comments, so much depends on visual effects.

The first side could be best described as fairly typical movie schmaltz with titles like: "I Never Dreamed Someone Like You Could Love Someone Like Me" and "At The Prom" but side two carries more "interesting" titles as: Bucket Of Blood – School In Flames – Mother At The Top Of The Stairs – Collapse Of Carrie's Home.

The basic story line is that of a fairly plain American schoolgirl who tormented by her fellow pupils and a deranged mother, takes her revenge by her exercise of the gift of telekinesis; like Uri Geller only more so, with rather horrifying results! (N.J.M.)

☆ ☆ ☆

SCOTT JOPLIN. Music from the Original Motion Picture Soundtrack. MCA Records, stereo MCA 2098.

Those who enjoyed the music in the film of the life of Scott Joplin now have the opportunity to purchase a good memento. The recording quality is good, particularly so since it is a film sound track. Most of the music arrangements are for piano with orchestral backing.

Some of the Scott Joplin tunes featured are as follows: Mapel Leaf Rag – The Entertainer – Solace – Pleasant Moments – Peacherine Rag – Weeping Willow – Wall Street Rag – Heliotrope Bouquet. (L.D.S.)

☆ ☆ ☆

CAL TJADER AT GRACE CATHEDRAL. Fantasy 36198. Festival release.

After reading the promo leaflet with this record, one gets the impression that Cal Tjadar has been around in the music scene for some time, working as percussionist for people like Dave Brubeck and George Shearing. The

CARPENTERS – LIVE AT THE PALLADIUM. CARPENTERS. A & M Records. L 36201. Festival release.

On this record, Richard and Karen present a very smooth and professional show. The first side shows off very well their many and varied talents, while the second side is almost wholly composed of one large medley of their most famous hits.

Apart from the clapping, this next side is very enjoyable. On the technical side, the recording is excellent, except that I found out how much modern vinyl records will flex when I tried to get it off my turntable. It looked like I had the two edges about 150 mm above the platter bar before it freed itself from the spindle. (D.W.E.)

venue for this enjoyable recording session was the Grace Cathedral in San Francisco, about a year ago, the occasion being a charity concert.

Most of the tracks have a strong latin feeling about them and side one is taken with two long tracks; I Showed Them — Bluesology; side two starts with Black Orpheus Medley, followed by an exciting version of the old standard "Body And Soul" and "Theme". The ambience of a live performance is captured nicely but there is the occasional trace of acoustic overload of the system. However, overall, the quality is good. (N.J.M.)

☆ ☆ ☆

REFLECTIONS OF LOVE. Roger Whittaker EMI Records Ltd EMC 3140. Stereo.

The relaxed easy style of Roger Whittaker will be well known to many readers by now, particularly since his memorable love song "The Last Farewell". On this album, the love theme of "The Last Farewell" is continued with this collection of twelve songs, some Roger Whittaker's own compositions.

The track titles are: It's Your Love – Before She Breaks My Heart – Indian Lady – Time – My World – Say My Goodbye's To The Rain – Here We Stand – Summer Days – Pretty Bird Of Love – All The Way To Richmond – Let Me Be Your Sun – New Love.

My reaction – pleasant, easy-on-the-ear listening. Recording quality is excellent. (G.S.)

☆ ☆ ☆

25 OF THE WORLD'S GREATEST LOVE SONGS. The London Strings. M7, stereo MLR 191.

Lush strings lull your spirits and create the atmosphere for romance. If that is your wish then this fine album will fit the bill. The arrangements are pleasant without being too saccharine and the recording quality is good.

Some of the 25 tunes featured are as follows: Where Do I Begin – Love Me Tender – Strangers In The Night – A Lover's Interlude – Speak Softly Love – Yesterday. (L.D.S.)

☆ ☆ ☆

CARA MIA. The Disco Sound of Paul Delicato. M7 stereo MLF 153

If you are a fan of Tom Jones, Engelbert Humperdinck or even Lovelace Watkins, then high voltage vocalist Paul Delicato is certain to have tremendous appeal. His is the sort of record you slap on the turntable to send you ripping through the chores or to get people on their feet and dancing at a party. Like those singers above Paul Delicato has the range and vitality to set up almost any song. And he is backed with some excellent arrangements.

Recording quality is not marvellous but the standard of performance makes up for that. A good buy.

Ten tunes are featured, two in medley form: Cara Mia – It's the Same Old Song – Happy Together – What Becomes Of The Brokenhearted – I Can't Make It All Alone – Lean On Me – I Couldn't Live Without Your Love – Just Enough To Keep Me Hangin' On – Baby Face – You Must Have Been A Beautiful Baby – Spirit Of America. (L.D.S.)

☆ ☆ ☆

SHAMAL. Gong. Virgin Records L 35871. Festival release.

Gong rely heavily on a wide range of instruments to produce an interesting jazz-rock sound which at times can be most impressive.

Particularly ear catching are the vastly contrasting "Cat In Clark's Shoes", which assaults the listener with a host of sounds, and the moody, flute dominated "Mandrake". The remaining tracks are more routine.

In terms of quality the record was quite clean, although a small amount of surface noise could be detected on my copy. (D.W.E.)

☆ ☆ ☆

SIDE SHOW. Barry Biggs. M7 Stereo MLF 168.

Barry Biggs is a Jamaican singer with a voice that almost ranges up to a soprano on twelve pleasant love ballads including: Side Show – You Are My Life – Goodnight My Love – Work All Day

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LIGHTER SIDE

—You'll Never Get To Heaven — Sweetest Little Thing — That Girl I Knew — Your Kiss Is Sweet — The Road Is Rough.

Barry Biggs started off in show-biz as a sound recordist and cameraman with the Jamaican Broadcasting Corporation and has had wide experience in Europe and the USA as well as Great Britain. His high voice may not be to every taste but it is at least a change! (N.J.M.)

☆ ☆ ☆

THE BIG BAD ROCK GUITAR OF GLEN CAMPBELL.
Capitol stereo VMP 1006.

Big bad rock guitar of Glen Campbell? Improbable though it may seem, Glen Campbell does not sing a note on this album. Instead, as suggested by the title, he plays lead guitar in a rock group who play in very much the same style as the Ventures. It makes lively listening, whether you are jiving or just foot-tapping.

There are 12 tracks in all: Walk, Don't Run — Ticket To Ride — Steve's Shuck — Spanish Shades — The Lonely Arranger — The James Bond Theme — It's Not Unusual — King Of The Road — Sassy — Mr Tambourine Man — Spring Mist — Beef Jerky. (L.D.S.)

☆ ☆ ☆

KENNY BALL AND HIS JAZZ MEN.
Saturday at The Mill. Spiral MLF-183 M7 release.

Kenny Ball fans will enjoy this light-hearted romp in the jazz idiom with 11 titles: Saturday Night At The Mill — Sunday — Sweet Painted Lady — Feline Stomp — Them There Eyes — You Can't Get To Heaven By Living Like Hell — Lady Of Spain — I've Got Plenty O'Nuttin — Taint What You Do — Lilli Marlene — Down By The River. Some of the lyrics will cause a raised eyebrow or two.

The band: Kenny Ball, trumpet, flugel horn, vocals; Andy Cooper, clarinet saxophone, vocals; Ted Baldwin, banjo, guitar, vocals; Vic Pitt, bass, bass guitar; John Parker, piano; Ron Bowden, drums. Quality, excellent. (N.J.M.)

☆ ☆ ☆

ROCK AND RHYTHM.
Raymond Lefevre and his Orchestra. Barclay L-36217 Festival release.

Raymond Lefevre is one of that international breed of band leaders that produces a bright sound rendition of all the recent hits, the sound that some people call 'wallpaper" music. Perhaps the description is a little unkind because, as a background to social pleasantries, these discs can't be beaten. The quality is excellent.

The titles: Fly Robin Fly — Yesterday — A Whiter Shade Of Pale — S.O.S. — Oh Happy Day — Mississippi — Raindrops Keep Falling On My Head — The Hustle — Soul Coaxing — Charly Brown — El Condo Pasa — Save Your Kisses For Me — Bridge Over Troubled Water — Africa. (N.J.M.)

☆ ☆ ☆

WES MONTGOMERY, MOVIN'.
Milestone L-45735-6 Festival release.

This two record album of the late, great Wes Montgomery would be required listening for anyone with a liking for jazz guitar at its best. It was originally recorded in two sessions in 1960 and 1962 and remastered in 1977 with extensive sleeve notes and a full rundown on the backing personnel.

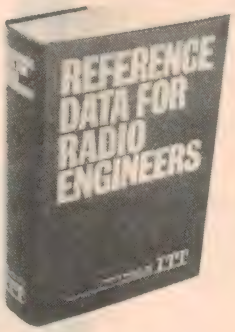
There is a total of 13 tracks, with: MOVIN' Along — I Don't Stand A Ghost Of A Chance With You — Tune-Up — Body and Soul — So Do It — Says You — Sandu — Full House — I've Grown Accustomed To Her Face — Blue'n'Boogie — Cariba — Come Rain Or Come Shine — S.O.S. The quality overall is very good; an album to be enjoyed. (N.J.M.)

Books & Literature

Reference tome

REFERENCE DATA FOR RADIO ENGINEERS. Sixth Edition, first printing, 1965. Published by ITT and Howard W. Sams & Co Inc. Hard covers, pages not sequentially numbered, 240mm x 160mm, freely illustrated by diagrams, graphs, etc. Price in Australia, $40.05.

Commonly referred to in the USA as the "Engineer's Bible", this ITT publication has been around since 1943 and has sold something like 450,000 copies of the editions preceding this one. Now further revised and up-dated, the sixth edition can hardly be anything but a notable work and a worthwhile addition to any reference library.



With the pages in each chapter separately numbered, it would take a mathematical exercise to nominate the total number but they are all crammed with information and add up a book about 6cm thick.

With 48 chapters in all, plus a huge 46-page index, it would take more space than is available here merely to list the chapter headings; but the following summary may give some idea of the scope covered: Frequency data; Units, constant, etc; Materials; Components; Networks; Filters (4 chapters); Attenuators; Impedance measurements; Magnetic reactors, amplifiers, filters; Electron tubes & circuits; Semiconductors & circuits; Optoelectronics; Modulaton; Propagation, waveguides, transmission lines, antennas; Noise & interference; Broadcasting, etc; Radar; Space; Optical communcations; Nuclear physics; Quantum electronics; Computers; Information theory; Statistics; Reliability; Fourier; Maxwell; Equations & Tables.

In describing the contents, it is perhaps appropriate to emphasise the words in the title "Reference Data". There is a fair amount of descriptive text in the book but is there mainly to provide continuity for the actual reference data—tables, graphs, circuits and so on: all the data which busy engineers and undergraduates may need to refer to in a hurry, without having to search through half the books in the library. And, as will be apparent from the listing earlier, the range of subjects is very wide.

So there it is: a book compiled primarily for engineers; a book to refer to rather than to read; packed with an enormous range of data.

Our review copy from Prentice-Hall of Australia Pty Ltd, P.O. Box 151 Brookvale, NSW, 2100. (W.N.W.)

Programming micros

MICROPROCESSOR - MICROPROGRAMMING HANDBOOK, first edition (second printing), by Brice Ward. Published by TAB Books, USA, 1976. Soft Covers, 130 x 210 mm, 293pp, many diagrams and tables. Recommended retail price $9.75.

This book would be an invaluable aid to those with a grounding in electronics who wish to learn about the new and expanding field of microprocessors and their programming. The introductory chapters give the reader a good grounding in microprocessor fundamentals. The text progresses from background information to a discussion of basic computer and microprocessor structure, architecture and systems.

The first four chapters are concerned with this basic material, while the next four chapters are concerned with actual systems. In order, the actual systems covered are the MCS-4, the MCS-40 (4004 and 4040), and the MCS-80 (8080), all from the Intal Corporation, and the MC6800, from Motorola Semiconductor Products.

The remaining four chapters are concerned with the various types of memory systems in common use, and with microprogramming. This latter subject accounts for most of the last main section of the book. Sample programs are given in both machine and assembly languages.

The back of the book contains a list of common computer terminology abbreviations and a glossary, as well as a list of microprocessor manufacturers and a comparison of their products, and a list of the MCS-80 support family.

In conclusion, while it must be said that the book is somewhat biased towards the earlier microprocessors, this should not detract from its value to the student. The opening chapters contain much valuable information which is applicable to any microprocessor system, while most of the principles covered in the remainder of the book are also applicable to any microprocessor.

Review copies came from the Technical Book and Magazine Company Pty Ltd, 289-299 Swanston Street, Melbourne Vic. 3000, and also from Dick Smith Electronics Pty Ltd, PO Box 747 Crows Nest, NSW 2065. (D.W.E.)

Tape recorders

NEWNES TAPE RECORDER SERVICING MANUAL, Second Edition, Volume 1. Edited by John Gardner, MAES, MBKS, Ass.ISTC. Published by Newnes-Butterworths, London. Hard covers, 207 pages, 245mm x 185mm, freely illustrated by drawings and photographs. Price in Australia $17.50.

Whatever value this book may have in Britain, I cannot imagine it appealing to too many people in Australia, apart from those who are really involved in—and dedicated to—the repair of all and sundry tape players.

This volume number 1 is devoted to domestic tape equipment, mainly open-reelers and mono cassette machines, of brands far more common in Britain than in Australia, and released during the years 1968-1970. The brands include: Abba, Beocord, Elizabethan, Ferguson, Fidelity, Grundig, ITT, Kenwood, Marconiphone, Philips, Sanyo, Sony, Tandberg and Uher.

A few of the machines represented might still be giving good service in Australia but many others would either be little known or getting to long in the tooth to warrant extensive service.

But, if you are involved in this field and need all the information you can get, you'll find reproduced in this book as much circuitry and mechanical data as the author could reasonably extract from the manufacturers' service sheets. We understand that Volume 2, which we did not see, covers models released during the years 1971-4. Our review copy came from Butterworths, 586 Pacific Highway, Chatswood, NSW, 2067. (W.N.W.)

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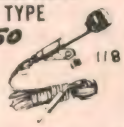

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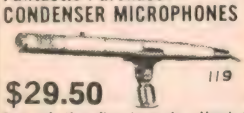

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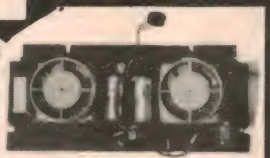

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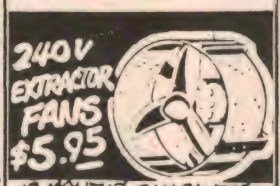

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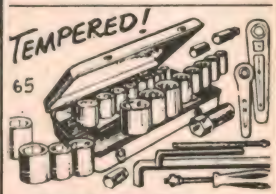

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New Products

Compact digital multimeter has LED readout

The B & K Precision Model 2800 Digital Multimeter can measure DC and AC voltage and current, along with DC resistance. It has a high input impedance on all voltage ranges, and features a 3½-digit 7mm high LED readout. With automatic offset correction and automatic polarity switching, it offers simple range interpretation and high resolution.

The unit is mounted in an attractive yellow and black plastic case measuring 110 x 160 x 50mm. At the top of the case is an on/off slide switch, with the display underneath it. Two rotary switches are provided at the bottom of the case, one used as a function selector and the other for range. Recessed banana sockets are provided for connection of the test leads, which are supplied with the unit.

Four DC voltage ranges are provided, with nominal full scale readings of 2, 20, 200 and 2000V. A point to watch is that on the 2000V range, the maximum voltage allowable is only 1500V. Accuracy is quoted as ±0.5% of reading, ±0.25% of full scale and ±1 LSD on the three lowest ranges, with the highest range having approximately half this accuracy.

Four AC voltage ranges are provided, with nominal full scale readings of 2, 20, 200 and 2000V. Average reading circuitry is used, calibrated to read the RMS value of a pure sine wave. The frequency response is quoted as being from 50 to 400Hz. The quoted accuracy is substantially the same as that on the DC ranges. On the highest range, maximum allowable voltage is 1000V.

The input impedance on all voltage ranges is 10 megohms, while overload protection is provided up to 1500VDC or (DC + AC) peak.

Four direct current ranges are provided, with full scale readings of 2, 20, 200 and 2000mA. Quoted accuracy is ± 1% of reading, ± 0.5% of full scale and ± 1 LSD on the three lower ranges, with the top range having approximately half this accuracy.

As with the voltage ranges, the AC current ranges are similar to the DC current ranges. The current ranges are protected by a fuse (accessible from the front of the instrument) and by diodes. The nominal voltage drop across the input terminals is 200mV DC or RMS on the three lower ranges, and 700mV DC or RMS on the upper range.

Six ohms ranges are provided, with full scale readings of 200 ohms, 2000 ohms, 20 kilohms, 200 kilohms, 2 megohm and 20 megohm. Test currents are 1mA on the two lowest ranges, 10uA on the middle two ranges, and 100nA on the highest ranges. Full scale voltage applied to the test resistor is 0.2V on the 200 ohm, 20 kilohm and 2 megohm ranges, and 2V on the remaining ranges.

Since three of the ohms ranges apply a maximum voltage to the test resistor of 200mV or less (and this is indicated on the front panel by a H/L ohms indicator), it is possible to perform in circuit tests where there are semiconductor junctions shunting the test resistor.

Similarly, the high ohms positions can be used to make out of circuit tests of semiconductors, in a similar manner to the way in which forward and reverse bias tests are performed with a conventional multimeter.

Overrange indications are provided on all ranges by the display flashing 1999. Negative readings are indicated by a minus sign, with the absence of this implying a positive reading. The settling time for all ranges and functions is typically 0.7 seconds. Power is supplied by four "C" size cells.

These can be either carbon-zinc or alkaline, or rechargeable nickel-cadmium types. An optional charger/converter is available for this last type. A comprehensive instruction manual and circuit diagram is supplied.

In conclusion, the B & K Precision 2800 digital multimeter appears to be a well-designed and constructed test instrument, which would be equally at home in a professional or amateur/hobby test room. It is distributed in Australia by Parameters Pty Ltd, of 68 Alexander Street, Crows Nest 2065. Recommended price is $131 plus 15% sales tax if applicable. (D.W.E.)

Flattened actuator for toggle switches

C & K Components Inc., USA, is now offering yet another toggle configuration to help improve panel appearance and function.

The new toggle, P4, is a short, flattened actuator, available as an option on any of C & K's 1 pole through 4 pole toggle switches. Dimensions are 8.13mm x 4.19mm at its largest diameter.

P4 features C & K's unique anti-rotation rivet pin. This pin secures the toggle to the bushing and assures true linear toggle motion.

Further information is available from C & K Electronics (Australia) Pty Ltd, PO Box 101, Merrylands, NSW 2160.

Wide band, variable persistence, storage oscilloscope

BWD Electronics Pty Ltd, has now added the Model BWD 845, high sensitivity, wide band, portable, variable persistence, storage oscilloscope to its extensive oscilloscope range.

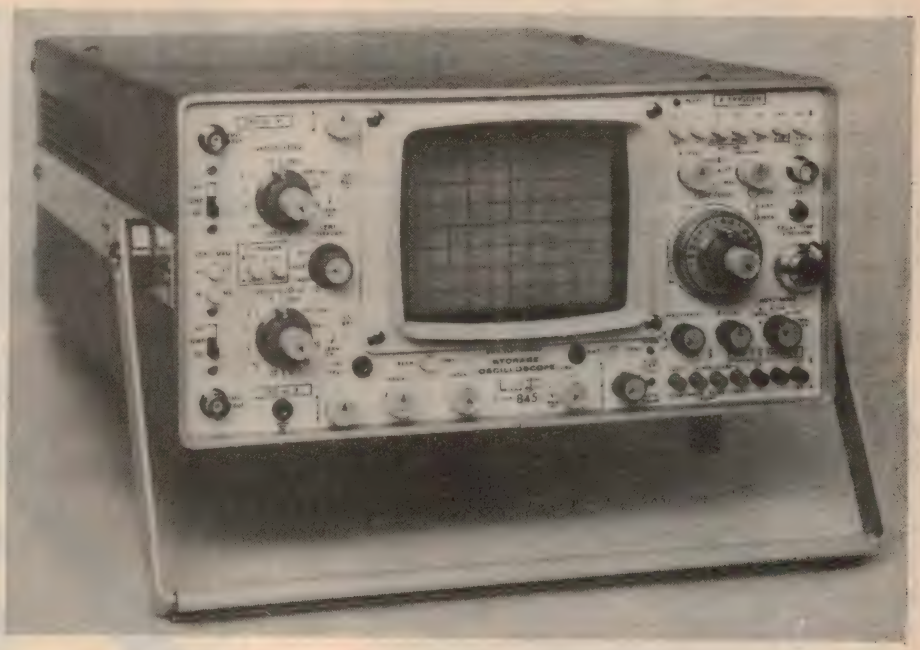
This model incorporates a wide range of storage modes, has high sensitivity (1mV), 30MHz bandwidth vertical amplifiers, wide range delayed or mixed time base with comprehensive trigger facilities, and can be either mains or battery powered.

The BWD 845 provides two operating conditions for the storage mode — fast and normal. By writing in the fast mode then switching to normal, storage times up to 50 minutes are available depending on background level. Additional signals can of course be stored at any time during this period.

Maximum writing speed is specified at 1usec/div but speeds up to 5 div/usec can be achieved over most of the screen. Repetitive displays can extend the writing speed to the bandwidth limit of the oscilloscope.

Many storage scopes offer only a limited pretrigger period before the CRT fades positive, when attempting to store single shot transients. The BWD 845 incorporates an Auto Store facility to hold the CRT in the erase mode. This extends the waiting period to several hours before the time base is triggered, writes the display, then automatically switches to store.

Another feature is the Auto Write, View and Erase cycle which continuously erases the display, then awaits for a signal to be written, switches to view for approximately four seconds, then erases and the cycle repeats.



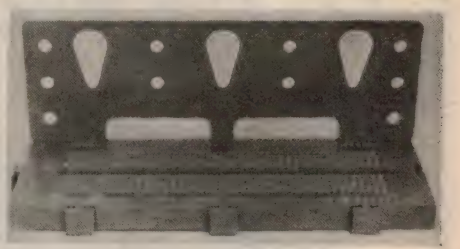
In addition to providing a high performance instrument, BWD Electronics has given considerable attention to internal mechanical design to provide ease of alignment and servicing. Circuits are based on thick film networks, and standard readily available integrated circuits and discrete components.

The attractive cabinet design with colour co-ordinated controls incorporates a carrying handle and provision for battery pack and front panel protective cover fitting. A range of accessories is available to further extend its versatility.

Further details are available from BWD Electronics Pty Ltd, Miles Street, Mulgrave, Victoria 3170.

Prototyping aid

Dick Smith Electronics has submitted for review a sample of the Bimboard prototyping aid. It is intended for use with integrated circuits, but can also be used successfully with discrete components.



The breadboard consists of two sections, the base section which performs the interconnections, and a clip-on plastic backplate which can be used to mount controls, switches and terminals. The base section contains two rows of contacts, each row being divided into columns of five contacts. There are 47 pairs of columns.

In addition, there are rows of contacts at the top and bottom of the assembly, which are intended to be used for power supply rails. Each individual socket is capable of accepting wires with diameters between 0.25mm and 0.85mm, and can carry a current of 1 amp.

Each Bimboard is fitted with lugs on all four edges, which enable separate units to be coupled together to form a larger unit. They are available from Dick Smith Electronics Pty Ltd, and have a recommended retail price of $22.50. (D.W.E.).

"Bin Boxes" for component storage

Efficient and convenient component storage is a common problem, whether it be for the individual in his workshop or the businessman on his stock shelves. A neat and economical solution to this problem is offered in the form of "Bin Boxes" — stout corrugated cardboard containers specifically designed for just this application.

Bin Boxes are made by Corrugated Paper Manufacturing Co Pty Ltd, of Leichhardt NSW and are available from Radio Despatch Service, 869 George Street, Sydney. Radio Despatch are stocking four sizes, three of which are illustrated. These are the models 1000 (230 x 100 x 100mm), 2000 (300 x 50 x 110mm), and 4000 (300 x 150 x 110mm). The model 3000 measures 300 x 110 x 100mm.

The boxes are supplied flat but are easily folded into their final shape and lock together quite rigidly.

Recommended prices (one off) are: Model 1000 37c; Model 2000 42c; Model 3000 45c; Model 4000 56c plus 15 per cent sales tax where applicable. Radio Despatch anticipate that prices for quantity orders (above 25, mixed sizes) should be substantially lower.

Roll your own 1kVA power transformer!

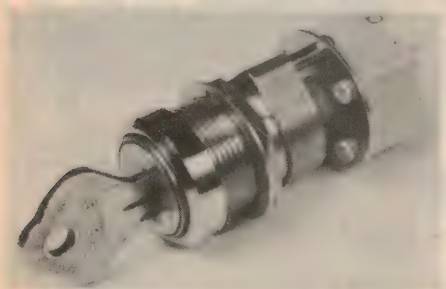
Designed for experimental work, this power transformer has an unusual and unique design feature — it lets you determine the output voltage by winding on your own secondary (or secondaries).

Rated at a hefty 1kVA, the new transformer measures a bulky 240 x 185 x 120mm (H x W x D). The unit features a primary winding wound on a large toroidal core, fully encapsulated in epoxy and enclosed in a heavy duty, high impact plastic case for safety. Mounting feet and a carrying handle are fitted to the case.

The user winds the secondary (or secondaries) himself, a feature which enables the secondary voltage to be tailored to requirements. Each turn through the toroid core gives 1V, the only precautions necessary being to ensure that the secondary winding is capable of carrying the required current and that the transformer rating is not exceeded.

The unit is expected to sell for less than $100. For further information contact Warburton-Franki Pty Ltd, 372 Eastern Valley Way, Chatswood 2067.

Key-operated switch



A range of Yale key operated security switches is now available from C & K Australia.

Switch type KMS (pictured) is available with a double pole mains switch and carries a rating of 4A at 250V AC or 10A at 12V AC. The unit has a two-position 60° movement, and the key may be trapped or withdrawable in either position. Alternatively, a spring return or non-latching style can be provided.

Switch type KRA allows for the stacking of switch wafers at the rear of the mechanism, giving a maximum number of six positions at 60° indexing. This offers the same circuit flexibility as a multi-pole multi-bank rotary switch.

The lock mechanism is a Yale 5-disc type supplied with two keys and offering 200 different key combinations.

Enquiries to C & K Electronics (Aust.) Pty Ltd, PO Box 101 Merrylands 2160.

Name change

MS Components Pty Ltd has advised that the company has now changed name to Sheridan Electronics Pty Ltd. The company will continue trading at 164-166 Redfern St, Redfern 2016. A wide range of electronic components and equipment is offered.

Nutdriver set for service work

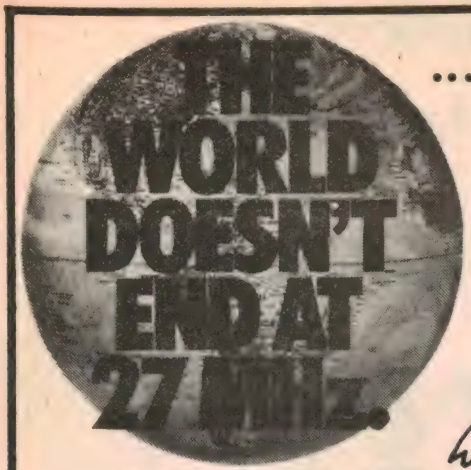
The Cooper Tool Group, Albury, now has available the PS-120 Xcelite nutdriver set for electronic and service engineers.

The set consists of 10 small nutdrivers and a torque amplifier. The torque amplifier handle slips over the nutdriver handles to provide a larger gripping surface, extended reach and increased driving power.

Nut sizes catered for by the PS-120 nutdriver set range from 3/32-inch to 3/8-inch. The complete set is contained in a convenient plastic carrying case, as pictured.

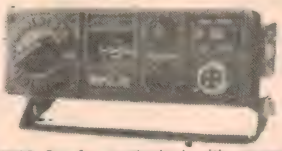
Readers requiring further information should contact The Cooper Tool Group, Nurigong Street, Albury, NSW 2640.

....TOPS FOR HAM GEAR



DISTRIBUTORS OF QUALITY ICOM PRODUCTS

ICOM



IC22S 2m fm synthesised with programmable matrix. ICOM quality with back-up technical support. Price $279.

WARNING: The law requires that a licence be held for all transmitting equipment. Purchasers may be asked to produce a licence when buying equipment.

HANDY ICOM PORTABLES

IC202 2m ssb/cw	$199
IC502 6m ssb/cw	$219
IC215 2m fm	$199
BC-20 nicad pack	$57
IC50L 10w linear 6m	$98
IC20L 10w linear 2m	$98
Rubber Ducky for IC215	$13

ICOM

IC-245

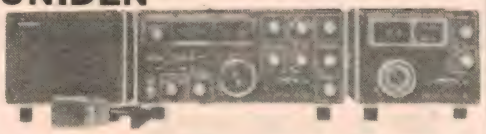
VICOM brings the VFO revolution to you with the IC245 mobile 144 thru 148MHz transceiver. The IC245 features accurate tuning over 50 detent steps, digital display in 5KHz steps, modes: fm, ssb (with optional adapter only) and cw. Carrier suppression better than 40dB. TX output 10w fm. Comes complete with mic, bracket, manual and VICOM 90 day warranty.

ICOM IC211 2m fm transceiver
The new IC211 from **VICOM** is the last word in digital 2m, all-mode transceivers. Fully synthesised in 100Hz or 5KHz steps, has dual tracking, optically coupled VFOs with 7 digit LED readout. One knob controls all frequencies. Modes fm, usb, lsb, cw. Internal 240vac and 13.8vdc power supply. Comes complete with VICOM 90 day warranty.
freight and insurance.

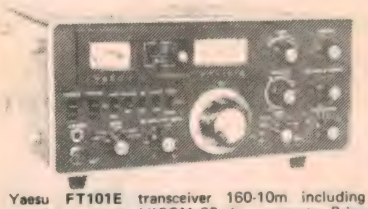
... It's just the beginning.

At **VICOM** *we provide a whole World of communications products including CB, Military and Amateur Radio, our speciality.* **VICOM** *didn't reach the top without providing Amateurs in Australia with the technical back-up and support demanded in marketing specialised sophisticated commercial equipment. Come and see our wide range of transceivers and accessories and receive some of that friendly personalised service for which* **VICOM** *has become famous!*

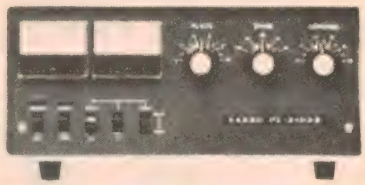
UNIDEN .... the best value



The fabulous **UNIDEN 2020** p11 transceiver offers separate usb, lsb and cw 8-pole filters as **STANDARD** and 6146Bs in the final with screen grid voltage stabilisation for minimum distortion products. Features pcbs and even the front panel can be swung out for easy servicing! A comprehensive range of spare parts is available together with back-up service support. Overseas this rig sells for at least $65 more than the FT101E! Compare the features of the UNIDEN 2020 with other HF transceivers and you'll quickly be convinced that it offers the best value!



Yaesu **FT101E** transceiver 160-10m including speech processor, VICOM 90 day warranty. Price **$839.**



The **FL2100B** linear uses two rugged 572B carbon plate tubes in class B grounded grid circuit with individually tuned input coils for each band. Covers 80 thru 10 metres at 1200W pep input. Price $524.

FL-2100B linear amplifier

KENWOOD

The **TS820S** from **VICOM** is the rig that is the talk of the Ham bands. Too many built-in features to list here! What a rig and only $990 complete with digital display! Many accessories available to increase your operating pleasure and station versatility.

Popular VC2 swr/pwr meter operates 3-150 MHz with power measurement 12/120 watts. Will handle up to 1000 watts. 50 ohms impedance, twin meters. A bargain!

VC2 SWR $38

TS520S the transceiver that has made the Kenwood name near and dear to amateur operators around the World. Reliability is the name of the rig in capital letters! 160 metres thru 10 metres with many built-in features.

ATLAS 350-XL

The **ATLAS 350-XL** from **VICOM** is the new, all solid state ssb transceiver, 350w pep input with coverage 160 thru 10 metres. Plug in options include digital display, auxiliary VFO and auxiliary oscillator. Superb selectivity for which ATLAS have become famous.

ANTENNAS

BASE & MOBILE

Space 2m ¼wave model 42S, complete with assembly	$14
Space 2m 5/8 wave model 82D, complete with assembly	$26
Lindenow 5/8 wave quality 2m (ecl base)	$26
Ringo Ranger ARX-2 for 2m	$45

VHF/UHF BEAM ANTENNAS

JAYBEAM

5Y/2M 2m 5el 7.8dBd gain	$29
8Y/2M 2m 8el 9.5dBd gain	$35
10Y/2M 10el 11.4dBd gain	$59
10XY/2M crossed yagi 11.3dBd	$68
D8/70cm twin 8el 12.3dBd	$48
PBM18/70 cm 18el 70cm 14.9dBd	$59
MBM88/70cm 88el 70cm 18.5dBd	$75
MBM48/70cm 48el 70cm 14.5dBd	$59

PARABOLIC DISH ANTENNA
For 430 and 1296MHz $349

NOISE BRIDGES

Te7-01 up to 100 MHz	$39
Te7-02 up to 300 MHz	$49

MORSE KEYS

Economy model KH70E	$19
Operator model HK706	$20
Deluxe model HK702	$35
Electronic Keyer EK103	$159
Manipulator MK701	$38

RECEIVERS

Yaesu-Musen FRG-7	$325
Barlow-Wadley with FM	$339
NRD-505 Professional	$2499

ROTATORS

ART3000C Heavy Duty with 240v con box	$199
ART9000 Super Heavy Duty 240v con box	$478
CDE CD44 medium duty 240v control box	$192
CDE AR22XL light duty 240v control box	$109
8 core cable per meter	$1.40

TRAP DIPOLES

AL48DXN 40/80 metres	$49
AL24DXN 20/40 metres	$47
MIDY VN 80 thru 10 m	$65

BALUNS

AS-BL (Asahi) for beams	$30
BN-86 (Hy-Grain) for beams	$30
BL50A 50 ohms, 4kW model	$24
BL70A 70 ohms, 4kW model	$24

The new **HAL KSR3000** send/receive RTTY terminal including keyboard and video display, features scrolling, continuous, word or line transmission and firmware for word wrap-around and blankfill. Handles Baudot and ASC11 (8-level) with a screen size up to 1152 chs. List price **$1499.** Write (including SAE) for complete specifications.

A whole world of communications products.

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Direction: Russell J. Kelly VK3NT
Peter D. Williams VK3IZ

The Amateur Bands

by Pierce Healy, VK2APQ

What does the future hold?

This month's notes feature a message written on behalf of the WIA federal executive, concerning CB radio, which every amateur would be wise to consider at length. Also included are details of an amateur radio seminar and the usual club notes.

Will the current loss of the 11 metre band to the CB radio service actually result in a future gain for amateur radio in Australia?

This seems to be a topical subject discussed among amateurs. Here are some points for consideration. From the Wireless Institute of Australia federal executive headquarters came a copy of the main QSP for the October 1977 issue of the WIA magazine Amateur Radio.

Under the caption "CB — What Now?" Michael Owen, VK3KI, writes on behalf of the federal executive.

"Legal CB is a fact of life

"Amateurs have 'temporarily' lost the 11 metre band. We say 'temporarily' not because we do not accept the sincerity of the Minister and his advisers (we do), but because we doubt the practicability of clearing that band when the time comes.

"The Institute believes that there are grounds for legitimate criticism of the way the issue has been handled and also that there are some very valuable potential advantages for the amateur service arising from the introduction of CB.

"Let's make our criticism clear. Quite apart from the loss of the 11 metre band, bad enough in itself, there are features that make that loss worse

"The Institute argued that novices should be allowed to use the 10 metre band. The Department insisted on allocating the 11 metre band. So novices set themselves up on 11 metres only to be told to shift back to the very band the Institute had proposed all along. Many amateurs have expressed concern that might seems to have become right. Meanwhile, the law abiding amateur sees legitimate request after request piling up in some bottomless Departmental pending tray.

"The Institute does not criticize CB as such. It does, however, see recent history as a sorry story of Departmental procrastination, bungling and ineptitude.

"In fact, the Institute sees the introduction of CB as an important phase in the growth of amateur radio in Australia. Most CBers want to be law abiding. There are a few that have shown themselves to be irresponsible, to say the least, but the same criticism could be levelled at some (though very few) amateurs.

"For many, CB is the first introduction to radio communication. Many have found quickly how much more the amateur can do. They aspire to become amateurs, first novices, then full licensees. That is no new discovery on our part. The ARRL has embarked on a program of seeking to attract CBers to amateur ranks. Many individual clubs in Australia have already started to do that, too.

"The numbers of amateurs in the USA and the membership of ARRL has grown thanks, in part, to CB. We say 'in part' because the other part has been the active encouragement of converts by ARRL and US amateurs. The message for us is clear. We are not at war with CB radio. We want CBers to upgrade to amateur radio.

"We should make one point clear. It was suggested that CB could be introduced in Australia as a fourth kind of amateur licence, without code, and with no more proficiency than the ability to know which knob to turn. The Institute rejects that flatly. That is pulling the amateur service the wrong way — we hope that CBers want to become amateurs. If amateurs become CBers the whole foundation for the amateur service is lost. We have privilege, yes, but that is privilege that has been earned, individually and collectively.

"So let's sum up what the Institute says about CB and the wider implications of recent history. We have made our point about the manner in which CB has been introduced. We take that point further. With the introduction of CB we have seen a significant area of deregulation. The Institute has, we believe, acted with responsibility and restraint. We urge amateurs individually to do the same. But that should not be the basis for the Department to pretend that amateurs can be ignored. It is now up to the Department to show that it can be responsive to the highly disciplined and law-abiding group constituting the amateurs of this country

"Our next point is this. There is a law governing the use of radio frequency. We have seen that law not enforced, but ignored. The Institute sees real need for new legislation, capable of proper enforcement, dealing, for example, harshly with hoax distress calls and the like. That law should be enforced. Curbs in government spending are not a matter on which the Institute makes any general comment. It does make the specific comment that law enforcement should not be curtailed for reasons of economy. The law must be a law that does not inhibit the legitimate use of radio frequency by pettifogging regulation, but does enable easier control of illegitimate use of radio frequency. Unnecessary regulation imposes a cost burden on the administrator and licensee, and may be self-defeating in that restriction without reason will never achieve acceptance.

"Our final point is this. We welcome the introduction of CB radio as a vast reservoir of potential amateurs. Many, we know, will be content to use what they now have. Others will, for the very reasons that led them into CB, seek to widen their horizons by becoming amateurs.

"We will be very foolish indeed if we do anything less than offering these people the fullest encouragement to upgrade to amateur radio."

In Sydney NSW some amateurs who were operating on the 11 metre band prior to the introduction of CB radio are now operating on this band as CBers within the regulations. They have formed the Amateur and Citizens' Radio Club (VKCB Club). They are using the words "Amateur Radio" in lieu of the "VK" prefix to their amateur call sign. The aim is to give example on good operating techniques as well as helping the newcomer who is having equipment problems or the CBer who wants to know more about amateur radio.

The stated philosophy of the VKCB club is that it recognises the interest in amateur radio among the CBers as well as assisting CBers to become amateurs they are also assisting the on air community in the use of radio as a communication medium.

The club aims to affiliate with the Wireless Institute of Australia and its Youth Radio Scheme and the NCRA, and will attempt to organise national involvement of amateurs and CBers.

Membership requirements for those not holding an amateur licence include a five-hour training session by one of the club's instructors. On qualifying, such members will be allocated a call sign — Amateur Radio followed by the standard state number and a numerical suffix, eg. for NSW — Amateur Radio 2 001.

The secretary is Sam Voron, VK2BVS, 2 Griffith Avenue, Roseville, who provided this information.

AMATEUR RADIO SEMINAR

A seminar with the theme "Antennas and Propagation", organised by the Frankston and Mornington Peninsula Amateur Radio Club, will be held over the weekend 19th and 20th November, 1977. The venue is the Prince of Wales Hotel, St Kilda, Melbourne.

The club is interested in encouraging delegates from interstate and country areas and is subsidising the accommodation costs, limited to 30 interstate, on a first come first served basis.

FAMPARC Seminar program details:

Saturday —

9.00-10.15 Registration.
9.45-10.10 Coffee and conversation.
Morning session:
10.15-10.45 Introduction and opening "WARC and You". Michael Owen, VK3KI.
11.00-11.40 "Design of Long Yagi Antennas for VHF and UHF". Les Jenkins, VK3ZBJ.
12.00-12.40 "Construction and Applications of Parabolic Reflectors". Ray Naughton, VK3ATN.
1.00- 1.55 Lunch.
Afternoon Session:
2.00 2.40 "Meaningful Antenna Measurements". Peter Cousins, VK3BFG.
3.00- 3.30 "Antenna Requirements for Earth Satellite Communications". John Sved, VK3ZVZ.
3.40- 4.00 Coffee break.
4.00- 4.40 "HF Propagation and Amateur Radio". Earl Russell, VK3BER & Associate.
End of session.
Dinner.

Sunday —

10.30-11.00 Wireless Institute Broadcast.
Coffee.
11.15-11.50 "Emergency HF Antenna Systems". Harold Hepburn, VK3AFQ.
12.05-12.45 "Vehicle Mounted Antennas for HF Operation". Peter Williams, VK3IZ.
1.00- 1.55 Lunch.
2.00- 3.00 General discussion and question session — closing remarks, etc.
End of seminar.

Two package deals are available to interstate delegates —

Package 1 includes: Two nights' accommodation, twin share basis. Morning and afternoon tea, both days. Lunch, both days. Dinner, Saturday night. Also bound copy of papers. Cost $44.00.

Package 2 includes: One night accommodation, twin share basis; plus other items as above. Cost $38.00

Packages on a non-resident basis are available for local delegates. Package 3 as for package 1. Cost $35.00. Package 4 — Saturday only includes: Dinner Saturday night; morning and afternoon tea and lunch. Package 5 includes: Morning and afternoon tea and lunch Sunday only

As official carrier for the FAMPARC Seminar,

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200

AMATEUR BANDS

ANSETT Airlines offers a personalised service and personnel at their major city offices will be fully conversant with all aspects of this meeting.

Delegates who intend to travel by air should check air fares and flight times with their local Ansett contact and forward air fare and registration fee to:

Seminar Secretary, PO Box 38, Frankston, Vic. 3199, together with the following details: Name, address, phone No., call sign, flight No., time.

RADIO CLUB NEWS

LADIES AMATEUR RADIO ASSOCIATION: LARA has just celebrated its second birthday. Those Victorian members strong and foolhardy enough to brave the cold weather, ventured up to Cherokee on Mt Macedon where a birthday cake and barbecued burnt offerings were consumed.

LARA holds a regular weekly net on Monday evenings at 8.00 pm EST (8.30 pm during daylight saving time) on 3.65MHz.

Ladies interested in amateur radio may contact LARA through the net or the secretary, c/- 412 Brunswick Street, Fitzroy, Vic. 3065.

TOWNSVILLE AMATEUR RADIO CLUB: The third biennial North Queensland Convention held over the weekend 23rd-24th July, 1977, at the Hermit Park School, Townsville, was a great success.

The official opening was conducted by the Mayor of Townsville, Alderman P. Tucker. In his speech Alderman Tucker said he was very much aware that the Townsville Radio Club and amateur radio operators throughout North Queensland have a very high standing in their communities. Their specialist skills are very important to North Queensland in times of disaster, particularly when storms like cyclone Althea threaten the Queensland coast.

The convention program provided an interesting weekend for amateurs as well as for wives and families.

A highlight was the visit to the James Cook University, as guests of Professor James Ward and his associates Dr Mal Heron, Mr Stuart Bayliss and Dr Graeme Hicks. Speaking briefly on the subjects to be covered, Professor Ward mentioned ocean radar and the electrical activities associated with cyclones.

Other subjects were VLF work associated with the Americans at North West Cape in West Australia, the means to explore from 60 metres down, VNG work on 12MHz from Victoria to Townsville (results of which are being computerised), satellite cloud pictures, defraction patterns, laser / experiments, whip antennas, polarimeter and ionospherics.

Saturday evening was a social night with a smorgasbord and presentation of prizes. There was a barbecue lunch on Sunday, and visitors were treated to a display by the Townsville Highland Band and some of their young dancers.

Visitors included Dave Laurie, VK4DT president of the Queensland division WIA and Mark Churton, ZL1TB from New Zealand.

It was pleasing to receive a note from the convention convenor, Graham Sargent, VK4ZGB who commented: "Undoubtedly quite a few visitors to the convention came as a result of reading about it in your 'Electronics Australia' column."

GOLD COAST RADIO CLUB: At a recent meeting it was decided that future fox-hunts will carry a perpetual trophy for both first and last prizes. The next hunt has been organised for Sunday, 13th November, 1977, starting at 9.30 am from the Main Place shopping centre at Broadbeach.

A nice gesture has been made in relation to the GCRC general meeting to be held on the second Friday in November, as notified in the GCRD newsletter.

"As there is a member of the club who, due to health reasons, cannot attend our meetings, it is with great pleasure that arrangements have been made to take the meeting to Don's place.

"We trust that as many members as possible will try to attend as Don will get a great kick out of it."

The member is Don Soraghan, VK2PU, who lives just across the Queensland border at Kingscliff, NSW.

DARWIN AMATEUR RADIO CLUB: The president, Graham Vayro VK8CEG, reports that the novice licence scheme operated by the club appears to be working well and he has finally seen reward for many hours spent restoring outpost and marine radios for novice use. The AM/CW net is well attended and they are proud that Darwin is probably the only place where a new novice licensee can at least get on the air with a club owned AM/CW transceiver with no personal financial outlay.

On Sunday, 12th June, 1977, the club provided communications for the Darwin Annual Beer Can Regatta. The exercise was a success and certainly contributed greatly to the success of the regatta.

Three things were achieved. First and most important was the public relations aspect. It was a good start in placing amateur radio back in the public eye in its true context. Secondly, as a WICEN exercise, valuable experience was gained in what would appear to be a simple matter of operating portable, handling messages and maintain net discipline. Thirdly, the opportunity was provided for new members to gain experience.

SUMMERLAND RADIO CLUB: Two classes are in progress for the novice examinations and an invitation is extended to those wishing to increase their knowledge to attend club meetings held on Fridays at 7.30 pm in St Peters Church of England Hall, Ballina Road, Goonellabah, NSW.

Warwick Ford, VK2ZLD has colour TV operating in the 70cm band with 150 watts of video and intercarrier sound. The transmitter, converter, video mixers, effects generator and sound gear are all home built. The colour camera is a commercial valve type. Very good results and coverage are achieved.

MID SOUTH COAST AMATEUR RADIO CLUB: This club was formed about one year ago for the main purpose of establishing a repeater on 144MHz to serve the Princes Highway and pleasure resorts along the coast from Kiama to Narooma. At present their repeater, VK2RMU, is operating on Channel 2 from a temporary location at Milton.

The club has established an access point for the Mt Ginini repeater (VK1RGI on Channel 7) for use by those travelling through Ulladulla. This is a beam antenna at the side of the road with a length of feeder to connect to equipment in a car.

Amateur operators wishing to make use of this facility should contact the secretary, Doug Allen, VK2YDA, 1 Geoffrey Street, Ulladulla, NSW 2539. Telephone (044) 55-2394. Club membership totals around 50, scattered from Sydney to south of Narooma and westwards to Canberra. A club net, 'Lyrebird net", runs on Channel 2 repeater VK2RUMU each Wednesday evening at 8.30 pm.

ILLAWARRA AMATEUR RADIO SOCIETY: The VK2AMW moonbounce (EME) tests for July were made on the 27th with WA2VWL, YV5ZZ, W5FF and XE1RY. Although VK2AMW echoes were 6dB to 7dB above noise none of the scheduled stations appeared. K3NSS was heard on 432.015MHz and later on 432.010MHz with signal strength up to 15dB above noise. This big signal came from a 25.5 metre dish antenna at the US Naval communica-

tion Station in Washington DC.

Repairs to the antenna dish surface were made during August and the main part of the Clavin feed system was made and installed. Initial tests showed little improvement in gain, but the required impedance matching arrangement has yet to be installed to give the lowest SWR.

An E-M-E test scheduled for the 2nd September, 1977, resulted in a contact being made with F2TU with "M" reports both ways. The other station scheduled for tests, SM2BFK, was not heard.

The committee of the IARC has decided to assist the WIA with WARC 79 expenses, and has organised a guessing competition. The first prize is a single beam CRO-Trio CO1303D with a 75cm tube and is good to 5MHz.

Second prize is a Texas Instruments programmable calculator and third prize a Texas Instruments digital watch.

Entry fee is $1.00 with a maximum of 1000 tickets. Details from the secretary, PO Box 1838, Wollongong, NSW 2500.

WEST AUSTRALIAN VHF GROUP (INC): Office-bearers elected at the annual general meeting in July 1977 are: Rod Henderson, VK6RH — president; Bob Pine, VK6ZFY — vice-president; Peter Morgan, VK6ZEG — secretary; Jack Zeffertt — treasurer; committee — Ron Fisher, VK6PR; Tom Berg, VK6ZAF; Gill Weaver, VK6YL. Graham Grieve, VK6ZDO — materials officer; Danny Robinson, VK6TZ — beacon officer; David Laws, VK6DS — Librarian and Wireless Hill resident.

Wireless Hill Museum committee — Wally Howse, VK6KZ; Jack Sullivan, VK6ZFO; Tom Berg, VK6ZAF.

A comprehensive tentative program and timetable have been drawn up for the Wireless Hill Museum project. Two dates have been fixed, opening in August-September 1979 and budgetary subsmission for 1978-79 for the Melville City Council in March 1978.

WESTLAKES RADIO CLUB: The WRC conducts a club net each Friday night from 6.00 pm to 7.30 pm around 3565kHz. This net allows members from all around Australia to meet each other. The club equipment is a TS520S under the guiding hand of Dave McKie, VK2BWK and second operator Eric Brockbank, VK2ZOP. An 80 metre dipole antenna 18 metres high is used and an average of around 20 join the net. The club call sign is VK2ATZ.

Another net is conducted each Wednesday evening at 8.00 pm on 28.55MHz by Michael, VK2AMJ, using the call VK2ATZ/P.

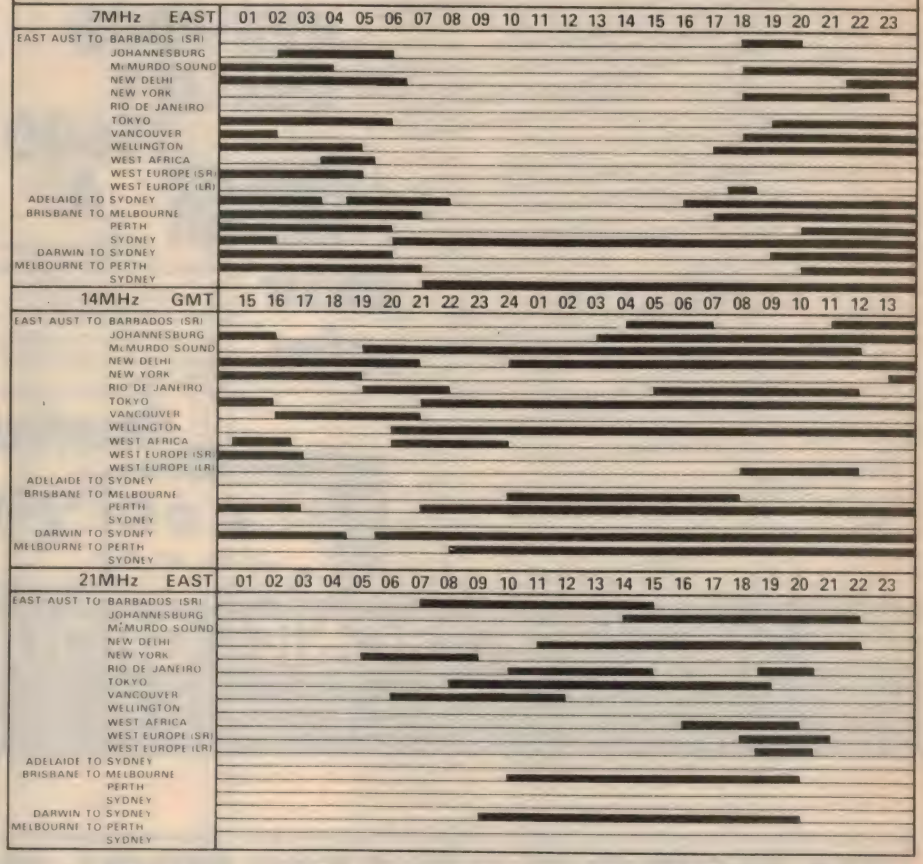
A broadcast on each Monday evening at 6.30 pm on 3565kHz is intended as an information net. If you have any questions about the club or any activity, join in and enquire.

The popular "Manual of Questions and Answers for the Novice Licence" has been expanded and is now in its fifth edition.

It is published by the WRC as an educational service to novice licence candidates and course instructors. There are now more that 3000 copies in circulation in Australia, and it is available from the Westlakes Radio Club, PO Box 1, Teralba, NSW 2284. The cost is $3.50 post paid. Ten or more cost $3.00 a copy, postage paid.

IONOSPHERIC PREDICTIONS FOR NOVEMBER

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open. 11.77



YRS TRIAL EXAMINATION

Trial examinations conducted by the WIA Youth Radio Scheme have greatly assisted candidates for the P&T Department's novice licence. The following report received from John Kolm, VK3YJK, YRS examiner in Victoria, may assist candidates in avoiding pitfalls. This is an abbreviated report of statistical information compiled with the aid of a computer. The full report has been published in the YRS magazine "Zero Beat".

"The April 1977 trial novice exam was the first to be conducted by the YRS in Victoria. It has been a great success and will be repeated bi-annually from now; the next trial exam is scheduled for April 1978.

"There were 61 candidates. The pass rates were as follows —

"Theory section: 46%; regulations section: 48%; telegraphy section: 19%.

"Only 15% of candidates passed in all sections. This low pass rate was largely caused by the high failure rate in telegraphy receiving.

"Theory scores ranged between 28 and 96, with a mean value of 64.9. Facility values (percentage correct on each item) ranged between 15% and 92%. The weakest area was the section on AC circuits, especially reactance and resonance which were not well understood.

"Regulations scores ranged between 20 and 97, with a mean value of 66.2. Facility values ranged between 30% and 98%, the weakest area was the section on the "Q" code. This should be remedied, since the "Q" code questions are heavily weighted.

AN OPEN LETTER FROM DICK SMITH . . .

Dear fellow amateurs,
Do you ever get the feeling that amateurs are getting a raw deal? It seems to me that every man and his dog are suddenly becoming amateur gear experts. There are countless back-yard operators offering amateur gear at 'bargain' prices.
On face value, it looks like a really good deal. But look a bit closer and you find it's not quite all it could be. Half the time the gear is sold without any warranty — and if there is a warranty, the seller has neither the expertise nor equipment to effect it.
Is that a bargain?
My service department is one of the largest around. It's certainly the largest of any similar organisation. I'm proud to say that when a product is bought from one of my stores or dealers, the full resources of my organisation are behind that sale.
So next time you see a bargain and are tempted to buy, stop and think.
Can the seller offer you as much as I can?
Over to you . . . 73's.

Dick Smith
VK2ZIP

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NOW AVAILABLE . . .
Cat B-2259 .. .. .. $2.85

YAESU FRG-7

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The ultimate in a general coverage receiver — continuous tuning from 550kHz to 30MHz, fully synthesised for ultra stable reception in AM, SSB or CW modes. Sensitivity is better than 0.25uV (SSB) for 10dB S+N/N. Uses the famous 'Wadley Loop' principle ; operates from 240V mains or 12V battery. 52 ohm antenna.
A really incredible receiver! Cat D-2850.

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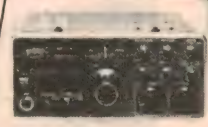

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(Left) This one covers 40, 20 & 10 metres, 200W input from just 3W of drive! Also has RF preamp; switching is RF actuated. 240V AC operated.
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(Also available) 10 metre linear, 12V DC, 50W from 3W drive (also works on 11m).
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APPLICATION Suitable for small home unit, showroom or household type installations. D16 & D25 amplifiers have good signal to noise ratio As such this makes them suitable as a booster in semi-fringe or fringe areas
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E.F.C.1	75 ohm for colour	Multi	31.43
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Audio Output: 3.5 watts typical

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THE COBRA 26 $120.00
The Cobra 26 is called "The Performance Radio" because professional drivers prefer the 26's top rated features and performance. Just check this list: Switchable noise limiting (ANL), RF gain control, Delta Tune, illuminated Power/S meter, adjustable squelch, PA output, detachable dynamic mike and much more.
The Cobra 26 operates at maximum legal power and critical sensitivities. What it really means to you is more enjoyable use of your CB operation. See for yourself why the Cobra 26 is the standard of comparison in the Citizens Band two-way radio industry.
No matter what the conditions, the Cobra 26 punches through loud and clear.

A big voice in a small package. The Cobra 19M $110.00.
If you've ever heard a Cobra 26, you'll know it's hard to believe all that talk-power is legal. Cóbra found the way to make their radios really talk and still obey the rules. Now you can talk just as loud and far with a smaller package. Cobra 19M is thin and narrow enough to mount conveniently in any car, even the latest subcompacts. And the 19M has other features you'd expect from a Cobra, such as a plug-in dynamic mike, external speaker jack, and now, even an illuminated RF/signals metre. The Cobra 19M has the same receiver sensitivity and selectivity as its big brother, Cobra 26. It has an efficient automatic noise limiter too; you'll hear clearly in the heart of heavy traffic. Dimensions 1½" H x 5⅛" W x 8" D. Power Output: Factory adjusted to 4 watts legal maximum. Modulation 100%. Sensitivity: Less than 1.0uV for 10dB (S+N)/N. Selectivity dB—6dB at 4kHz, 40dB at 20kHz. Image Rejection:—30dB. IF Rejection:—80dB. Audio Output: 2.5 watts into 8 ohms.

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ALL TYPES OF HARDWARE IN STOCK Wall Brackets, Chimney Mounts, J Brackets, Guy Rings & Guy Wire. Masts from 8ft to 50ft. ETC

Shortwave Scene

by Arthur Cushen, MBE

Radio amateurs and shortwave listeners will be looking forward to the meeting of the World Administrative Radio Conference in Geneva in 1979 when there is every possibility of the bands being extended for these two hobbies.

Due to heavy congestion in the shortwave broadcasting bands, shortwave broadcasters hope for band extensions, and so do the maritime mobile services, as well as the radio amateurs.

According to the World Radio and Television Newsletter their hopes are high due to the transfer of traffic from the fixed services in the high frequency bands towards satellite repeaters. As fixed services are alloted some 48 per cent of the total HF spectrum, it seems well possible for them to give up some frequency space in favour of the other services.

Shortwave broadcasters hope for a doubling of frequency space, achieved by doubling each shortwave broadcasting band, except the 25MHz band. Many shortwave broadcasters are of the opinion that the 41 and 60 metre band should be alloted on a worldwide basis.

Since 1959, the year of the last World Administrative Radio Conference, the growth of international shortwave broadcasting has been steady, and many new nations either have a shortwave service or are in the process of building one. All these new services deserve a place in the bands, and to achieve this the experts have calculated that the frequency space allocated to shortwave broadcasting needs to grow from a total of 2350kHz to about 4700kHz.

SYNCHRONISED TRANSMISSIONS

Radio New Zealand has two synchronised frequencies. The Whangarei station 1YX operates on 830kHz and carries the National program and recently the Kaitaia station, formerly on 1010kHz, was also moved to 830kHz. Also 1ZN Whangarei moved from 970kHz and 1ZK Kaitaia from 1440kHz so that both are now operating on 1010kHz.

Synchronised transmissions were introduced by 1XX Radio Whakatane on 1240kHz.

In Australia at present only two stations are synchronised on medium wave. These are 4QO Eidsvold and 4QB Maryborough on 910kHz which carry the ABC program. The New Zealand experiment is new and results in the release of two further frequencies in the congested medium wave band, with 1050 and 1440kHz now being free. There are plans however to move 2ZP New Plymouth from 1370 to 1050kHz, while Radio Auckland has moved to 1330kHz from 1590kHz.

KOREAN EXPANSION

Pyongyang Radio in North Korea has expanded its broadcast and some new frequencies are now being used. One of the best received is 11780kHz which has French 0800-0950GMT, Korean 1000-1100GMT and Chinese 1100-1300GMT. There are many broadcasts in English. The transmissions best heard in this area are 0600-0750GMT on 9420 and 11531kHz; 0800-0950 on 9420 and 11531kHz; and 2000-2150 on 3560, 6575 and 9420kHz.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT; add nine hours for West Aust. summer time, 11 hours for East Aust. summer time and 13 hours for NZ daylight time.

RED CROSS TESTS

The final test from the Red Cross Radio at Geneva using the facilities of the Swiss Broadcasting Corporation is scheduled for November 21, 23 and 25 and will be broadcast on 7210kHz. The times of broadcast are 0600-0700 1130-1230, 1700-1800, 2200-2300GMT.

On Monday the broadcast will be in English, Wednesday in French and German, and Friday in Spanish and Arabic. Reports are appreciated on these tests, and should be addressed to the Radio Division, International Committee of the Red Cross, Geneva, Switzerland.

NEW LAOS SCHEDULE

A verification letter in English and a complete schedule have been received after 20 months from National Radio of Laos, Vientiane. According to the covering letter the old Philips 25kW transmitters have been replaced by two transmitters of 10kW from a Chinese manufacturer. One is used for shortwave transmissions on 7145kHz and the other is for standby operation. The Director-General of Radio Laos, Mr Chaleun Vongsam-Ang, is anxious to receive reception reports.

The schedule of the External Service which operates on 1030 and 7145kHz is 2300-0130, 0400-0630 and 1130-1430GMT, with English news bulletins and program at 0100, 0600 and 1330GMT.

The Internal Serivvice is broadcast on 640 and 6130kHz, 2230-0200, 0400-0700, and 0900-1530GMT with all local programming.

RADIO ETHIOPIA

Radio Ethiopia at Addis Ababa has been heard on 9610kHz opening at 0400GMT. The station has an interval signal followed by a march, then time signals, and an announcement introducing the relay of the domestic program.

The Voice of Revolutionary Ethiopia, which uses the transmitters of the former ETLF, has been heard on a new frequency 6010kHz, as well as 7180kHz. The broadcasts in English are now 1500-1600GMT. The transmission opens at 1200GMT and during the hour long broadcast in English, news headlines are featured at 1500GMT and a full news bulletin at 1530GMT. The frequency of 6010kHz replaces the old channel of 6015kHz.

RECENT VERIFICATIONS

BOLIVIA: Radio Tropico, which operates on 4775kHz, uses 1500W and closes at 0400GMT, has confirmed our reception with an attractive postcard. The call sign CP120 is assigned to this frequency. The station address is Radio Tropico, Trinidad, Beni, Bolivia. The verification card was signed by Carlos Avila Alberdi.

FRENCH GUYANA: Radio Cayenne has verified our reception on 4972kHz with a card from Radio France Region 3. The card lists the shortwave frequencies as 3385 and 6170kHz (both 4kW), and 4972kHz with 1kW. The station was heard opening at 0930GMT on 4972kHz. The address is F.R.3 — B.P. 336, 97305 Cayenne, French Guyana.

NEW ZEALAND SCHEDULE

The Shortwave Service of Radio New Zealand is operating at new times due to the fact that daylight time was introduced into New Zealand on October 29. This means that all programs are heard an hour earlier by overseas listeners. New Zealand does not adjust its broadcasts to remain with GMT, and as the programs are a relay of the internal service they are broadcast at this earlier hour. This schedule is effective up to March 5, 1978.

Broadcasts to the Pacific are: 1800-2215GMT, 11960kHz; 2230-0250, 17710; 0300-0530, 11705; 0545-1030, 11780; 1800-0715, 15130; and to Australia 0730-1030, 11780kHz.

The DX World program will now be heard at 0915GMT on the first Sunday of each month and the Mailbox session at the same time on the third Sunday of each month during the period of daylight time in New Zealand.

LISTENING BRIEFS

EUROPE

BULGARIA: Radio Sofia is now using two frequencies in the 31 metre band for its English transmission to the United Kingdom 2130-2200GMT. The new frequency of 9530kHz provides the best signal, but reception on 9745kHz is also fair, though both frequencies suffer from interference.

ROMANIA: Radio Bucharest is using 5990kHz for its service to North America in English at 0400GMT. The reception in this area has been fair, though signals are spoilt at 0420GMT by Rome Radio which opens on the same channel. This transmission will be best on the higher frequencies during our summer months.

AFRICA

CAMEROON: Radio Yaounde was recently observed on 4925kHz around 1900GMT with announcements in French, but this frequency has been replaced by 4850kHz which is heard at the same time. According to Peter Bunn in Melbourne, reporting in Australian DXers Calling, the station was heard from 2000-2200GMT. This new channel of 4850kHz is also observed as parallel to 4972kHz, the latter channel continuing transmission until the station closes at 2300GMT.

AMERICAS

BRAZIL: Radio Nacional, Brazilia, has returned to the shortwave bands and is operating on 11780kHz, 1900-2400GMT. The transmitter which formerly carrried the broadcast to Europe on this frequency with English at 2100GMT was suspended from this operation in order to carry a program into the Amazon area, which was receiving strong signals from overseas stations, but a poor service from inside Brazil.

DOMINICAN REPUBLIC: Radio Clarin at Santo Domingo has introduced a second broadcast in English, and this is heard at 2130GMT. This transmission is for Europe and broadcast on 11700kHz. According to Sweden DXers a service to the United States is still transmitted at 2330GMT and the station plans to issue a verification card.

ASIA

PHILIPPINES: Radio Veritas has been heard on 11955kHz with an English program 1400-1500GMT. The station plays popular music on Saturday at 1412GMT and has a news bulletin at 1430GMT. The station address is Radio Veritas Overseas, PO Box 939, Manila, Philippines.

OCEANIA

COOK ISLANDS: Radio Raratonga has been observed on 9695kHz closing at 0834GMT, according to John Mainland of Wellington, NZ. There is some interference on the frequency from the French radio, which is also using the frequency at this time. Recently the station moved from 3265 to 5045kHz. Douglas Doull of Auckland, NZ, advises that they have a new address, PO Box 126, Avarua, Raratonga.

AUSTRALIA: Radio Australia has altered its program format on 5995kHz and now broadcasts to the Solomon Islands, New Hebrides and New Caledonia from 0700-0845GMT. Mark Shiell, Renown Park, SA, advises that at 0855GMT the station resumes its English transmission following the special service to the South Pacific.

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$23.95
Battery
and
Mirror
illuminated
Zoom
1200X
Similar To Above
$35.00

A. $1.70, B. $2.25, C. $2.40, D. $2.65.

P.M.G. TYPE TELEPHONES

Standard desk type with magneto bell calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line.

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(2 TELEPHONE SETS)

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125 to 140 M/hz. 28 volt DC operated AM single crystal locks both TX and RX on same channel complete with generator.

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EX ABC MAGNETIC RECORDING TAPES ¼"

PROFESSIONAL QUALITY

5" x 600'	$1.50
7" x 1200'	$2.75
10½" x 2400'	$5.95

P&P A. $1.10, B. $2.00, C. $2.25, D. $2.25

MINI-TOGGLE SWITCHES MIYAMA

SPST	3A	75c
SPDT	3A	95c
DPDT	3A	$1.25
SPDT	Centre-Off 10A	$1.25
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Please add postage

No. 62 TRANSCEIVER

With headphones accessories etc

$60

TELEPHONE WIRE

1 mile twin (2 miles) genuine ex-Army Don 8 perfect condition $35 per drum $2.00 cartage to rail freight payable at destination.

RCA 77DX MICROPHONES

PROFESSIONAL QUALITY $75
P & P A. $1.80 B. $3.50 C. $4.55
D. $4.55.

MORSE KEY	MORSE KEY BUZZERS
$1.75	$4.25
Post 40c	Post 60c

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A compact and handy tester for workshop or lab where quick circuit checks are required

DC Volts 2.5 to 1.000V (20.000 OHMS per volt) AC Volts 10 to 1.000V (10,000 OHMS per volt) DC Current 50 UA 25 MA 250 MA. Resistance 40 K OHM, 4 MEG OHM Decibels minus 20 DB plus 62 DB complete with instructions only **$23.95** Ea. P.O. $1.05. Multimeter similar to above 30,000 OHMS per volt **$29.50** P.P. $1.05.

Only $17.25 ea Post $1.05

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Drift Sight
Type B3
$250.00

4 DIGIT RELAY COUNTERS

50 volt DC, suit slot car Lap counters, etc.

$1.25 each P & P 60c

NIBBLING TOOL

Cuts sheet metal like a punch and die, trims, notches and cuts to any size or shape over 7 16inch.

ONLY **$12.50**

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1.2 Volt, fully charged, 4in x 3in x 1in 4 AH

$1.50 each P & P 80c

5" CRO TUBE 5 BPI $5.50 each

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Produces an Audio Signal in rich harmonics. Ideal for Sig Tracing in A.F., I.F., and R.F. circuits. Powered by 4 Penlight Batteries with On Off Switch and indicator lamp. Size 1½" Diam. 5" Long Only

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6BM8	$1.80		
6GV8	$1.50		
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6U4G	95c	1H6G	75c
6EF50	75c	832	$5.00
5Y3	$2.25	6X4	$1.80
2 x 2	75c	VR65	75c

P & P 40c

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Can also be adapted as a Dumpy Level or as base for a telescope has full 360° 5½" diam. gunmetal rotating circle. Adjustable elevation and depression. Has top grade ¾" diam. object lens. F.L.10" with cross hairs, eyepiece, ½" right angle prism.—height 10"—weight 3½kgs. With leather carrying case. Original cost $300.
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ZOOM SPOTTING SCOPES

30 x 30
LENGTH 12½", HEIGHT 10"
WEIGHT 1¾ lb.
$27.50

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Length: 22in
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High grade coated lenses. Ideal for pistol and rifle ranges or general viewing. Zooms in from very low to high powers. Complete with tripods.

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25 x 30 **$7.95**
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7 x 50	$43.95	B	$2.75
10 x 50	$44.95	C	$3.20
12 x 50	$46.00	D	$3.20
20 x 50	$47.50		

SMALL CLIP-ON POCKET TELESCOPE

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Transmitter No. 11 suits 210 **$35**
24 volt Power supply to suit above **$15**.
Or complete station with Headphones, Mic Morse Key, Antenna **$110**

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200 MA 24 volt, ⅛in push movement.
$2.50 P & P 20c.

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TRANSMITTER 3" MK2 $15.00

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Coils **$2.50** each P & P 60c

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1½" Diam 4½" F.L. **75c** 2½" Diam 2" F.L. **$1.50** each Or **$2.50** per pair P & P 40c

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⅜" **$25.95** ½" **$34.95** ¾" **$39.95**

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No cranking—in vinyl case. Ranges: Meg Ohm 0-1000 Megs. Centre 20 meg. Rated voltage 500 volts. Low ohm 0-1000 ohm OH 1 range 0-1 meg ohm on 1k range. AC voltage 0-250 volts. **$85.00**

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Suits PRC 25 and dozens of other uses. 15 volts long life only **$1.50 ea.**

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Directional Gyros.
AN5735-1 Air Operated.
Dimensions: 6inx5inx5in.
Weight: 2kgs
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$17.50.
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No C45 set 23 to 38 MHz with headphones, mic. 24V power supply etc. **$95.00**

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WITH HANDSET ANTENNA $25 EA
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240 volts operated. Complete with Speaker and Amplifier

CINEVOX $150.00
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7 transister model **$55** per set of two (hand held)
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Trans-Match Ham Tester SWR, RF Power, Modulation Percentage, Relative Field Strength. **$45.00** P&P A$1.65, B$2.75, C$3.20, D$3.20

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SK-100 Multimeter 100,000 ohms per volt, 12 Amps. AC or DC **$52.**
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SORRY NO C.O.D

INFORMATION CENTRE

200MHz DFM: I have constructed the 200MHz Digital Frequency Meter described in March 1977 and managed to get the unit operational with relative ease. However, I have struck some problems which I hope you can solve for me.

What loading effect, if any, would this unit have on RF and oscillator circuits when used on the highest range? The input impedance is quoted as 75 ohms shunted with 50pF. If there is a loading effect can it be predicted and allowed for?

No information on the construction of suitable probes was discussed. I require assistance here. Can the buffered output of the crystal be used to align the DFM? Is there any way that this unit can be interfaced with a voltage-to-frequency converter and thus be used as a digital voltmeter?

I have had problems with the LED readouts, having three failures (faulty segments) in as many weeks. This could be only an isolated case but, I feel, worthy of your notice.

Despite all precautions taken, I am still getting multiplex hash — a sort of tone interrupted and changing in pitch every two seconds. This is only evident when making measurements in the front end of an FM receiving circuit. (R.D., Corio, Vic.)

● The loading effect of any electronic measuring instrument depends on the ratio of its input impedance to that of the circuit or device being measured. For minimum loading, the impedance of the measuring instrument should always be higher than that of the circuit being measured. In your case, the loading effect of the DFM on VHF oscillator and "front-end" circuits could be severe, to the point where they malfunction.

Most work with DFMs does not require special probes so we have not designed any. The output of the crystal cannot be used to calibrate the DFM — another reference must be used. A voltage-to-frequency converter plus a DFM can be regarded as the basis of a DVM, but we do not regard the idea as a practical proposition for this particular instrument.

Your problem of multiplex hash breaking into an FM front-end is to be expected. These are very sensitive circuits, requiring only a few microvolts of signal for normal operation. You would have to go to very great lengths to reduce the hash below this level.

CDI: I would appreciate some advice concerning your CDI system published in July 1975. A friend of mine and I both have this CDI in our cars. Last summer we both had trouble with them. The unit appears to switch itself off in hot weather at high engine revs (in a four cylinder car) of 4000 rpm or more — especially, although not necessarily, under much load. It will not cut out if the engine is simply revved up in neutral. The ambient temperature needs to be around 37 to 39 degrees Celsius before this happens.

When it cuts out, it does so only for a second or so and then switches back on, then off again and so on. It almost certainly does not appear to be an EHT breakdown (coil, etc.). Both units are mounted in the coolest spot possible under the bonnet. Both units are supplied with the full 12 volts. As summer is coming around again, we would appreciate an answer on this one. (B.R., Glen Osmond, SA.)

● First, we must point out that in the case of an EHT breakdown, it is often not possible to give a clear diagnosis on the basis of engine behaviour when not under load. The fact that the engine is revving freely can mask misfiring. However, more often than not, the engine does not misbehave when not under load.

When the engine is under load the cylinder pressures are much higher and therefore the ignition voltage of the spark plugs is considerably higher. Combined with the fact that you are running the CDI from the full 12 volts (which can be as much as 15 volts with the engine at high revs) there is a greatly increased likelihood of EHT breakdown. Still, you may be right. It might not be an EHT breakdown.

Fortunately, the CDI has no way of knowing whether the engine is under load or not. So if it is going to misbehave it is just as likely to do so when the engine is not under load. This means that the CDI can be checked with the engine revving in neutral. A caution here though: Revving an engine to high speed while in neutral runs the risk of putting a piston through the block.

Having said all that, the best way to diagnose a problem in the CDI is to monitor the oscillation at the collector of one of the transistors with the aid of an oscilloscope. Failing this, use a multimeter to monitor the DC output from the inverter — this may or may not show the fault. If the CDI does have a temperature sensitive fault, it is likely to be caused by the SCR or one of the transistors.

AMPLIFIER HUM: I would like to know why my Playmaster 40/40 hums when the leads from the turntable are applied to the phono inputs⅜ Is it possible to add high and low filters, and a loudness control to the amplifier? (A.M., Mentone, Vic.)

● A likely explanation is that there is an "earth loop" created when you connect the turntable. This could be because the input cable shields are connected to the earth wire of the turntable mains cord. If you break this connection, a cure should result.

Some people have also found hum due to the fact that the headphone socket was not isolated from chassis, as recommended in the January 1977 issue on the Playmaster Twin 40W.

Notes & Errata

ALL WAVE TWO (Yearbook 1976/77, File No. 4/TR2/5): The lug connecting the 100*u*F, 0.1*u*F and 0.22*u*F capacitors should be connected to the adjacent earth terminal.

CORRECTION: The Nessel Audio advertisement published on page 34 of the October issue, the price of the SL1502 speaker should have been shown as $125.

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

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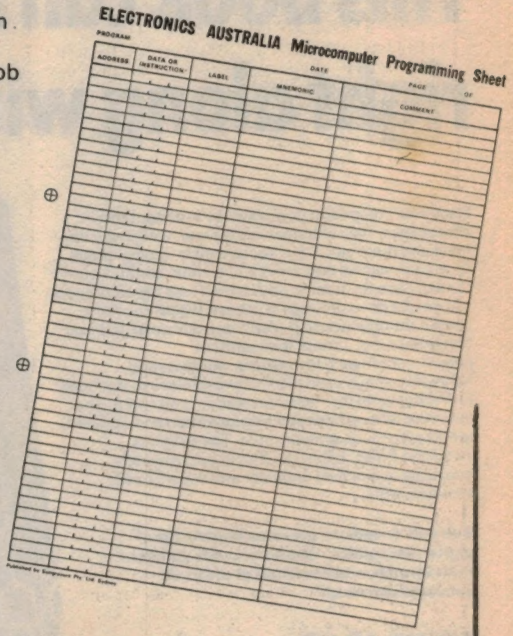

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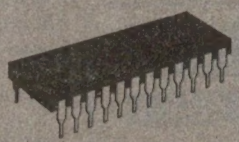

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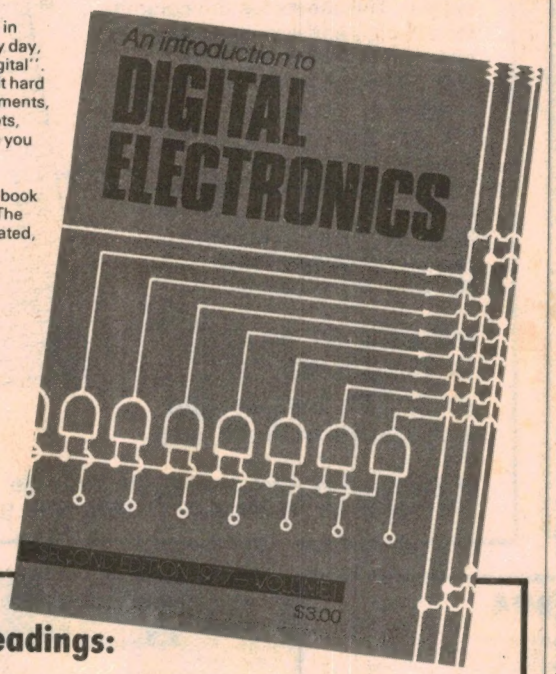

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10. Flipflops in counters
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Glossary of terms

Advertising Index

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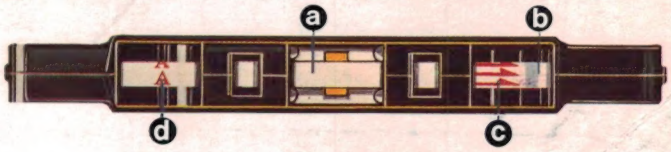

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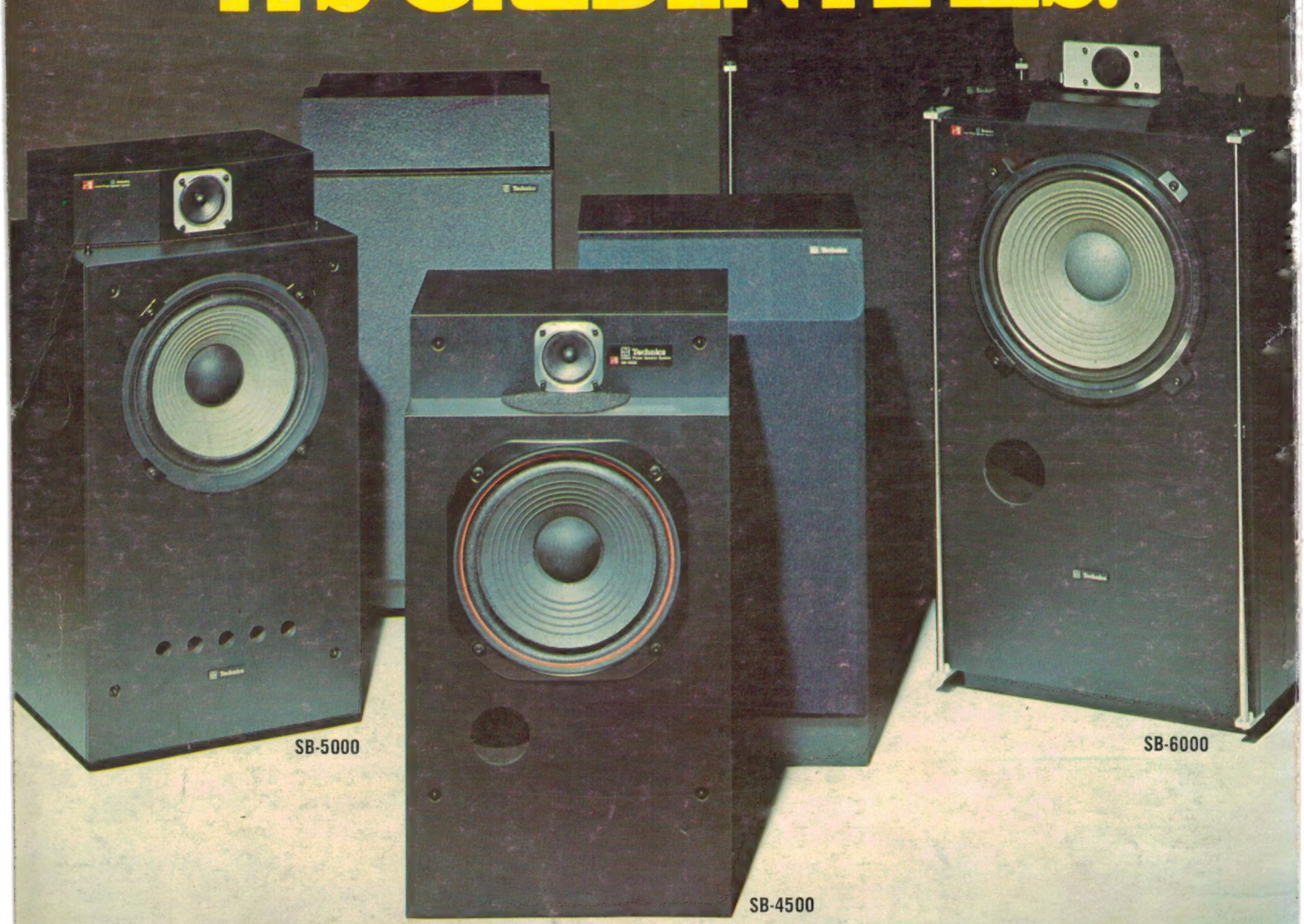

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Technics also offer the SB-5000 and SB-6000 linear phase speaker systems for high fidelity components of compatible quality and performance.

SB-4500
- Extra wide-range 25 cm cone-type woofer.
- 6 cm wide-range edgeless cone tweeter eliminates edge resonance and so reduces distortion • 75 watts peak power input.
- 92.5 dB/W (1 m) sound pressure level.

SB-5000
- Wide range 25 cm woofer.
- 6 cm wide-range edgeless cone tweeter delivers a crisp transparency of high frequency sound • 75 watts peak power input.
- 93.5 dB/W (1 m) sound pressure level.

SB-6000
- 30 cm woofer gives low distortion from super-low frequencies through the midrange.
- 3.2 cm dome tweeter gives high efficiency and low distortion.
- 100 watts peak power input • 93 dB/W (1 m) sound pressure level.

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